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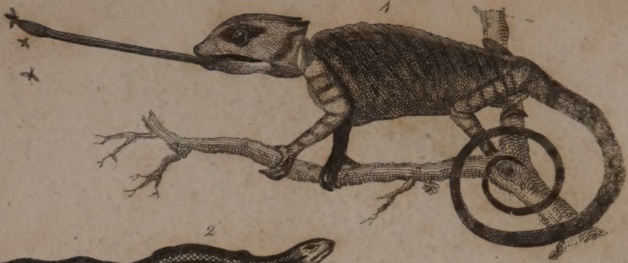

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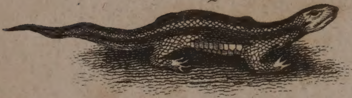

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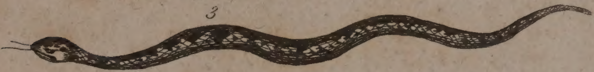

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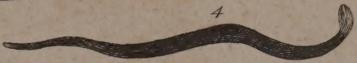

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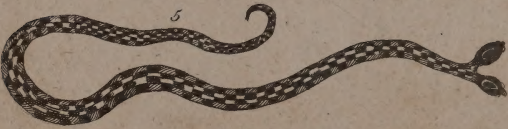

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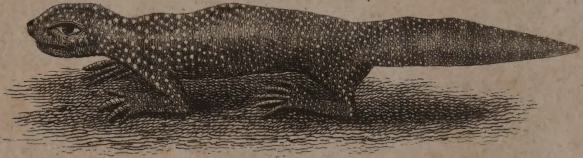

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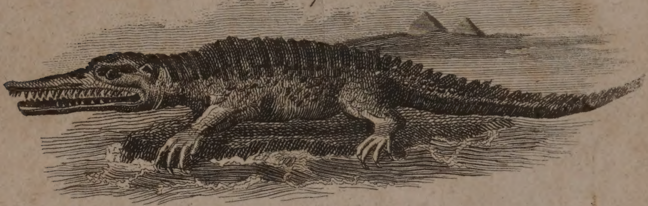

AMPHIBIA AND REPTILES.

Pub. May 1, 1806 by James Cundee, London.

# THE NATURALIST'S CABINET,

or

*Interesting Sketches*

OF

# Animal History.

VOL. 6.

*Published by James Cundee,*
London.

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# THE
# *NATURALIST'S*
# CABINET:

Containing
INTERESTING SKETCHES
OF
*ANIMAL HISTORY;*
Illustrative of the
NATURES, DISPOSITIONS, MANNERS, AND HABITS,
OF ALL THE MOST REMARKABLE
*Quadrupeds, Birds, Fishes, Amphibia, Reptiles, &c.*
IN THE KNOWN WORLD.

REGULARLY ARRANGED, AND ENRICHED WITH NUMEROUS
BEAUTIFUL DESCRIPTIVE ENGRAVINGS.

> "Who can this field of miracles survey,
> And not with *Galen* all in rapture say,
> Behold a *God*, adore him, and obey?"
>
> BLACKMORE.

*IN SIX VOLUMES.*

VOL. VI.

BY THE
*REV. THOMAS SMITH,*
Editor of a New and Improved Edition of Whiston's Josephus, &c. &c.

ALBION PRESS PRINTED:
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1807.

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# THE

# Naturalist's Cabinet.

## CHAP. I.

"—— Amphibious between sea and land."

MILTON.

## OF AMPHIBIOUS ANIMALS IN GENERAL.

### Introduction.

AMPHIBIA is a title given by Linnæus to animals which live occasionally on land and in water. They are divided into two orders, viz. reptiles and serpents; the former are furnished with legs, and have flat naked ears, without auricles; the latter are destitute of feet, fins, and ears; none have external ears. These animals have cold blood. From the peculiar structure of their organs, they are able to suspend respiration at pleasure, and thus to support a change of element uninjured. Their abode is usually in retired, watery, and shady places, where they are, most probably, stationed to prevent the excessive multiplication of water animals and insects; and themselves, in many instances, to serve as food for birds and fish. They do not chew their food, but swallow it whole, the throat and stomach being capable of great distention, sometimes receiving animals of greater thickness than themselves in a natural state. Some, but not many of them, live on plants or flesh. They have a power of enduring abstinence that would infallibly prove fatal to most other orders of animals. Several of the species have been known to exist, and be in apparent health and vivacity, for many months without food. Many assert that the hearts of the amphibia are furnished with only one ventricle; but more accurate physiologists are, however, of opinion that they have two ventricles, with an immediate communication between them. The blood is red, but cold, and in small quantity. The lungs consist, for the most part, of a pair of large bladders or membranaceous receptacles, parted into cancelli or small subdivisions, among which are beautifully distributed their few pulmonary blood vessels.

These animals in general possess a high degree of reproductive power, and when their feet, tail, &c. are by any accident destroyed, others will grow in their place. Their bodies are sometimes defended by a hard horny shield or covering, and sometimes by a coriaceous integument; some species have scales, and others soft pustular warts, or protuberances. Their bones are more cartilaginous than those either of quadrupeds or birds; several of the species are destitute of ribs; some are furnished with formidable teeth, whilst others are entirely without; some again are fierce and predacious, and others exceedingly mild. The majority, however, are inoffensive.

The bodies of the amphibia are cold to the touch; this circumstance, and their usually squalid and ugly form, have excited so great a disgust as partly to have founded the notion of all of them being venomous. Very few, however, except among the serpent tribes, and even of these not more than one sixth of the species possess this dreadful quality. They are all extremely tenacious of life, and some of them will continue to move and exert animal functions, even destitute of their head or heart. Their colors are often livid and disgusting, though some are decorated with most splendid skins. Many of them exhale a loathsome odor, owing perhaps to the foulness of their abode, or the substances on which they feed. Their voices are either harsh and unmusical, or else the animals are entirely dumb.

Amphibious animals are in general oviparous; the reptiles, therefore, or those that have four legs, are denominated oviparous quadrupeds, to distinguish them from the viviparous quadrupeds. They are usually very prolific. The eggs of some

some species are covered with a hard calcareous shell, whilst those of others have a soft tough skin or covering somewhat resembling parchment; the eggs of several are perfectly gelatinous. As soon as the parent animals have deposited their eggs in a proper place, they take no further care of them, but leave them to be hatched by the sun. In those few species that are viviparous, the eggs are regularly formed, but hatched internally.

The amphibia, though they are sometimes found in great numbers together, cannot be said to congregate, since they do nothing in common, and in fact do not live in a state of society. The flesh and eggs of some of the species form a palatable and nutritious food. These animals, for the most part, pass the winter in cold and temperate climates in a torpid state. During this season they are often found perfectly stiff, in holes under ice, or in water; they continue thus till revived by the returning warmth of spring; when they become re-animated, change their skin, and appear abroad in a new coat. Many of them cast their skins frequently in the year; but those reptiles that have an osseous covering never change it.

The Linnæan order of reptilia commences with the tortoise; but as the land tortoise is by many called an oviparous quadruped, we have given a description of it in our second volume, p. 288, and shall commence the present with an account of the marine tortoises, which may more justly be looked upon as amphibious, and which are usually denominated turtles.

## MARINE TURTLES.

THE marine turtles are distinguished from the others by their large and long fin-shaped feet, in which are inclosed the bones of the toes; the first and second only of each foot having visible or projecting claws. The shield, as in the others, consists of a strong bony covering, in which are embedded the ribs; in one or two instances this is much thicker and more strong than that of land tortoises. They are also found much larger; the sea, indeed, is possessed of the property of increasing the magnitude of animals congenial to that element. The great Mediterranean turtle is the largest of the kind which we know of, but its utility is by no means proportioned to its size; it is so far unfit for food, that it is even said to be poisonous; and the shell, which resembles an hide, is unfit for any useful purpose. One of these was caught in 1729, at the mouth of the Loire, nearly eight feet in length and two over, furnished with teeth in each jaw, and a tail quite disengaged from the body, fifteen inches in length. Some others of this species have been since taken upon our coasts, that weighed from seven to eight hundred weight; but an attempt to feast upon them has always been attended with disagreeable, or rather almost fatal consequences.

This is not the case with the different sorts which are imported for the gratification of luxury, and which are become the favorite food of those who are fond of eating a great deal without the danger of surfeiting. They were first introduced into England for this purpose about eighty years ago; and they are imported principally, if not entirely, from the West Indies.

However clumsy and awkward these animals may appear in their manners, they are, for the most part, extremely gentle and peaceable; and few, except the loggerhead and fierce turtles, make any resistance when taken. No animals whatever are more tenacious of life; even if their head be cut off, and their chest opened, they will continue to live for several days. They pass the cold season in a torpid state.

Four species of turtle have been mentioned as caught in the South Sea and Indian ocean, viz. the green turtle, the loggerhead turtle, the hawksbill, and the trunk turtle.

The green turtle is found in great quantities on the coasts of all the islands and continents in the torrid zone, both in the old and new worlds, where they feed on algæ and other marine plants. As they find a constant abundance of food on the coasts which they frequent, they have no occasion to quarrel with animals of their own kind for that which is afforded in such plenty to them all. Being able, like the other species of amphibia, to live even for many months without food, they flock peaceably together; yet they do not appear, like many other herding animals, to have any kind of association, but merely collect, as if by accident.

The length of these turtles is often five feet or upwards, and they sometimes exceed five or six hundred pounds in weight. They are so remarkably strong, that they can move along with as many men on its back as can stand there. Their legs are so far fin-shaped as to be of little other use than to swim with. Their shell is broader before than behind, where it is somewhat pointed. It consists of thirteen brownish divisions, surrounded by twenty-five marginal ones. The mouth is so large as to open beyond the ears on each side; this is not armed with teeth, but the bones of which the jaws are composed are very hard and strong, and furnished with points or asperities that serve in some degree the same purpose. With these powerful jaws they brouse on the grass, sea weed, and other plants which grow on the shoals and sand-banks, and with them they are likewise able to crush the shell-fish on which they sometimes feed. When satisfied they often retire to the fresh water, at the mouth of the great rivers, where they float on the surface, holding their heads above water, apparently for the purpose of breathing the fresh air; but, as they are surrounded with many enemies, they are very cautious, and the instant they perceive even the shadow of any object from which they suspect danger, they dive to the bottom for security.

The natives of the Bahama islands are remarkably clever in catching turtles. In the month of April, they go in their boats to the coasts of Cuba, and some of the neighboring islands, where, in the evenings and moonlight nights, they watch the going and returning of the animals to and from the shore, where they lay their eggs. They turn them on their backs on the land, and then leave them to perform the same operation on as many others as they can meet, for, when once turned, they are unable again to get on their feet. Many are taken in the sea, at some distance from the shore; these are struck with a kind of spear, whose shaft is about four yards in length. For this work two men usually set out in a small light boat, or canoe, one to paddle it gently along and steer, and the other to stand at the head with his weapon. Sometimes the turtles are discovered swimming with their head and back out of water, but most commonly lying at the bottom where it is a fathom or more deep. If the animal sees that he is discovered, he immediately attempts to escape; the men pursue, and endeavor to keep him in sight, and in the chase generally so far tire him, that in the course of half an hour he sinks to the bottom, which affords an opportunity to strike him with the spear through the shell. The head of the spear, which now slips off and is left in his body, is fastened with a string to the pole; and, by means of this apparatus, they are enabled to pursue him, if he should not be sufficiently spent without; if, however, that is the case, he tamely submits to be taken into the boat, or hauled ashore. There are men who, by diving to the bottom, will get on the backs of the animals; and then, by pressing them down behind, and raising their fore part, bring them by force to the surface of the water, where some person is in waiting to slip a noose round their neck. It has been asserted by Sir Hans Sloane, that the inhabitants of Port Royal in Jamaica, had formerly no fewer than forty vessels employed in catching these animals; their markets being supplied with turtle as ours are with butchers' meat.

The green turtles, (we are informed by Catesby,) very seldom go ashore, except for the purpose of depositing their eggs in the sand; this is done in April. They dig a hole, at high-water mark, about two feet deep, and drop into it above a hundred eggs; and at this time they are so intent on the operation, that they do not notice any one that approaches them, and they will even drop the eggs into a hat if held under them; if, however, they are disturbed before the commencement of their business, they always forsake the place. They lay their eggs at three, and sometimes four different times, fourteen days asunder, so that the young are hatched and come forth also at different times. After having deposited the eggs they scratch the hole up with sand, and leave them to be hatched by the heat of the sun, which is generally done in about three weeks. The eggs are each about the size of a tennis ball, round, white, and covered with a parchment-like skin.

The loggerhead turtle is one of the largest species, and in its general appearance has a great resemblance to the last. The head, however, is larger, the shell broader, and the number of segments of the disk is fifteen, of which the middle range is gibbous or protuberant towards their tips; the fore legs are large and strong, and the hind ones broad and shorter. These turtles inhabit the seas about the West India islands, and they are found in the Mediterranean, but particularly about the coasts of Italy and Sicily. They range very far over the ocean. One of them was seen in latitude thirty degrees north, sleeping on the surface of the water, apparently about midway between the Azores and the Bahama islands, and these were the nearest possible land. This circumstance was the more remarkable as it happened in the month of April, just at their breeding time.

These turtles are remarkably strong and fierce, defending themselves with great vigor with their legs, and being able to divide very strong substances with their mouth. It is asserted by Aldrovandus that, on offering a thick walking stick to the gripe of one that he saw publicly exhibited at Bologna, the animal bit it in two in an instant. Their principal food is shell-fish, which their strong beak enables them to break from the rocks; but their voracity, as asserted, even leads them to attack young crocodiles, which they often mutilate of their limbs or tail. For this purpose they are said frequently to lurk in the bottom of creeks along the shore, into which the crocodiles sometimes retire backwards, because the length of their body prevents them from turning readily; and, taking advantage of this posture, the loggerhead seizes them by the tail, having then nothing to fear from their formidable teeth.

The loggerheads, like the green turtles, lay their eggs in the sand. Their flesh is coarse and rank, but their bodies afford a considerable quantity of oil, which may be used for various purposes, particularly for burning, or for dressing leather. The plates of the shell are not sufficiently thick to be of great use.

Rondeletius, who was a native of Languedoc, kept one of this species, which had been caught on the coast of Provence, for a considerable time. It emitted a confused kind of noise, and frequently sighed.

The flesh of the trunk turtle and hawksbill is equally bad, but the shell of the hawksbill serves for many valuable purposes. The substance of the other shells is thin and porous; that of the hawksbill is firm, and when polished is beautifully marbled, weighing from three to six pounds. The shell consists of thirteen plates or leaves, of which eight are flat and five hollow; and are separated by putting a fire under the shell when the flesh is taken out, and by being scraped on both sides, they become beautifully transparent.

The substance that we call tortoise-shell is the production of the imbricated turtle, a species considerably allied to the loggerhead turtle, that is found in the Asiatic and American seas, and sometimes in the Mediterranean. The plates of this species are far more strong, thick, and clear than in any other, and these constitute the sole value of the animal. They are semi-transparent, beautifully variegated with different colors, and when properly prepared and polished, are used for a variety of ornamental purposes. They are first softened by being steeped in boiling water, after which they may be moulded into almost any form.

There are about eighteen other species inhabiting the fresh waters.

The snake tortoise is a native of America, and when full grown weighs from fifteen to twenty pounds. The shield is oval, and somewhat depressed; the middle pieces, which are thirteen in number, each rise into a kind of obtuse point; the margin near the tail is deeply serrated; the head is large, flat, triangular, and covered with a warty skin; the mouth is wide, and the mandibles are sharp; the neck, though it appears short and thick when the animal is at rest, is capable of being stretched out to a third of the length of the shell; the toes are connected by a web, and the claws are long and stout; the tail is straight, and about two-thirds of the length of the shell. In its general color this species is of a dull chesnut brown, paler beneath than above.

This animal preys on fish, young water-fowl, &c. which it seizes with great force, at the same time stretching out its neck and hissing. Whatever it once seizes in its mouth it holds so tenaciously, that it will suffer itself to be raised up rather than quit its hold. It lies concealed in muddy waters in such a manner as to leave out only a part of its back, appearing like a stone, or rough piece of wood, by which means it is enabled the more easily to lay hold of such animals as unguardedly venture near it.

## *THE CROCODILE.*

THE tail of this animal is two-edged; the feet triangular, the fore ones having five, and the hinder only four toes. Within the mouth of this beast are two jaws of numerous sharp-pointed teeth, thirty or more on each side; its eyes are large and fiery, projecting out of the head, and secured within an osseous orbit, but immovable, so that they can only see as they walk straight forward. The upper part of the snout and forehead consists of one fixed bone, reaching to the ears, which are broad, surrounded with a little border, and growing near the joint of the upper jaw, where also the largest scales begin. Some have toes both on their fore and hind feet, others have only four on their hind feet, but the fore feet have universally five, with pointed and crooked nails. The upper part of the body is fenced with chomboidical scales, so closely joined together, that no separation is discernible, and a circular streak on each.

The armour with which the upper part of the body is coated, may be accounted among the most elaborate pieces of Nature's mechanism. In the full-grown animal it is so strong as easily to repel a musket ball; on the lower part it is much thinner and more pliable. The whole animal appears as if covered with the most regular and curious carved work. The color of the full-grown crocodile is blackish-brown above, and yellowish-white beneath; the upper parts of the legs and sides are varied with deep yellow, and in some parts tinged with green.

The crocodile and alligator have the largest mouths of almost any animals. It has been

CROCODILE.

asserted by various writers, that both their jaws are movable; a single glance, however, at their skeleton, will afford sufficient proof that the upper jaw is fixed, and that the motion is altogether confined to the under jaw. They are also generally believed to have no tongue; this again is an error, for the tongue in both species is larger than even that of the ox; but it is so connected with the sides of the lower jaw as to be incapable of being stretched far forwards, as in other animals.

Crocodiles, (which in various parts of Asia and Africa attain the amazing length of twenty-five feet and upwards,) chiefly haunt such large rivers as the Niger, Ganges, Nile, or near the sea shore; they are exceedingly voracious, yet capable of sustaining abstinence for many weeks together. Except when pressed by hunger, or with a view of depositing their eggs, they seldom leave the water. Their usual method is to float upon the surface, and seize whatever animals come within their reach; but when this method fails, they then go closer to the bank. The artful creature there waits in patient expectation of some land animal that may come to drink; the dog, the bull, the tiger, or man himself. Nothing is to be seen on the approach, nor its retreat discovered till it is too late for safety. It seizes the victim with a spring, and goes at a bound much farther than such an unwieldy animal could be supposed to do. Then having secured the prey, it drags it into the water, instantly sinks with it to the bottom, and in this manner quickly drowns it. Sometimes it happens that the creature wounded by the crocodile makes its escape, in which case the latter pursues with some celerity, and often takes it a second time. He seldom moves far from rivers, except in covert and marshy places, so that in many parts of the East it is very dangerous to walk carelessly on the banks of unknown rivers, or among sedgy grounds; and still more so to bathe, without the utmost circumspection, in unfrequented places. The crocodile seldom pursues his prey far on shore; and although his pace is tolerably rapid in a direct line, yet he is not sufficiently swift to overtake an active man who preserves his presence of mind. This creature swallows all his food whole; and also stones, it is said, to aid digestion, in the manner of the seed-eating birds.

The female is said to be extremely cautious in depositing her eggs in the sand unobserved. The general number is from eighty to a hundred. They are not larger than those of a goose, and are covered with a tough white skin; she fills up the hole carefully before she leaves them. In each of the two succeeding days she lays as many more, which she hides in the same manner. The eggs are hatched generally in about thirty days by the heat of the sun, when the young immediately run into the water. These young are devoured by various kinds of fish, and their numbers are also lessened by supplying food to their own species. It is, however, in the destruction of their eggs that the most material service is effected. The vultures, and other ravenous creatures, devour and destroy millions of them; and even the negroes, who spare no pains to obtain them, esteem them delicious morsels.

Notwithstanding the extraordinary accounts given both by Linnæus and the most distinguished naturalists, yet the fact of the crocodile's devouring her offspring is doubted by some. There is one species of this creature called the open-bellied crocodile, which, like the opossum, is furnished with a false belly, into which the young creep when danger is apprehended; but probably this species is viviparous, and fosters her young, that are prematurely excluded, in this second womb until they arrive at maturity.

Of the time these animals exist, there are many opinions among the ancients, who were extremely partial to the invention of fables respecting them; but the most likely is that of Aristotle, who supposes the term of their lives to be about that of the human species. In some countries the crocodile is still an object of veneration.

There are various accounts given of the manner in which crocodiles are taken. The Javanese sometimes catch them with a hook and line, a circumstance that at first would seem almost incredible, since they are able, with great ease, to bite asunder the strongest rope. These people therefore use a very loosely twisted cord of cotton, at the end of which a hook is fastened, baited with raw flesh. When the crocodile, after having swallowed the hook, endeavors to bite the cord asunder, his teeth only separate the fibres, and all his attempts are of no avail. When he is found to be fastened, his antagonists come upon him in great numbers, and, with the weapons they have for the purpose, soon destroy him. In other parts of the world, these animals are hunted by means of strong dogs properly trained and armed with spiked collars.

Crocodiles are taken in Siam by the natives placing three or four strong nets across a river, at proper distances from each other; so that, if the animal break through the first, he may be caught in some of the others. When he finds himself fastened, he lashes every thing around him with great violence with his enormous tail. After he has struggled some time, and is become exhausted, the men approach in boats, and pierce him with their spears in the most tender parts of his body.

According to Labat, a negro armed only with a knife in his right hand, and having his left wrapped round with thick leather, will venture boldly to attack the crocodile in his own element. As soon as he observes his enemy near, the man puts out his left arm, which the beast immediately seizes in its mouth. He then gives it several stabs below the chin, where the skin is very tender; and the water coming in at the mouth, thus involuntarily held open, the creature is soon destroyed.

Crocodiles are occasionally tamed in many parts of Africa, where they are kept in large ponds or lakes, as an article of magnificence with the monarchs of those regions. The Romans frequently exhibited these animals in their public spectacles and triumphs.

This creature has been said to use many subtilties in order to allure travellers, particularly that of crying like a person in distress; but Bossman treats these accounts as fabulous.

## *THE ALLIGATOR.*

THIS creature is similar to the crocodile, only that its head, and part of the neck, are more smooth than the other, and the snout considerably wider and flatter, as well as more rounded at the extremity. The length of a full-grown alligator is seventeen or eighteen feet. Its teeth are as white as ivory, and snuff-boxes, charges for guns, and several kinds of toys are made with them. Those who have eaten the flesh say it is white, and very delicious;

indeed, many of the American tribes are said to be thereby supported.

In all probability this animal would never have been known by any other name than that of crocodile, had not the Spanish navigators, on their visiting the New World, of which alligators are inhabitants, remarked their great resemblance to the lizard, and therefore called the first of them which they saw lagarto, or lizard. When the English arrived there, and heard that name, they called the creature a-lagarto, whence the word alligato, or alligator, was afterwards derived.

The voice of this animal is very loud and dreadful, like the roar of a bull; they have also a very unpleasant and musky scent, so powerful, that Mr. Puges says the effluvia of them from one of the rivers impregnated his provisions, and even gave them the nauseous taste of rotten musk.

Alligators are often seen floating on the surface of the water like logs of wood, and are mistaken for such by various animals, which by this means they surprise, and draw down to devour at leisure. They are said also sometimes to form a hole in the bank of a river, below the surface of the water, and there to wait till the fish, that are fatigued with the strong current, come into the smooth water near to rest themselves, when they immediately seize and devour them; but since they are not able to obtain a regular supply of food, from the fear in which they are held by all animals, and the care with which these in general avoid their haunts, they are able, like the crocodile, to sustain a privation of it for a great length of time. When killed and opened, stones and other hard substances are generally found in their stomach. In many that Mr. Catesby examined there was nothing but mucilage and large pieces of wood, some of which weighed seven or eight pounds each: the angles were so worn down that he fancied they must have lain there for several months. Dr. Brickell also saw two alligators killed in North Carolina, which had several sorts of snakes and some pieces of wood in their bellies, and in one of them was found a stone that weighed about four pounds.

Of the voracity of these animals M. Navaretti in his "Travels" gives the following instance, of which he was informed a short time before he was at the Manillas. While a young woman was washing her feet in one of the rivers, an alligator seized and carried her off. Her husband, to whom she had been but that morning married, hearing her screams, threw himself headlong into the water, and, with a dagger in his hand, pursued the monster. He overtook, and fought him with such success as to recover his wife; but she, unfortunately for her brave rescuer, was found to be dead.

These creatures, like the crocodile and turtles, deposit their eggs at two or three different periods, laying from twenty to about twenty-four at each time. It is said that those of Cayenne and Surinam raise a little hillock on the bank of the river they frequent, and, hollowing this out in the middle, amass together a heap of leaves and other vegetable refuse, in which they deposit their eggs. These being also covered up with leaves, a fermentation ensues, by the heat of which, in addition to that of the atmosphere, the eggs are hatched. They generally lay their eggs in the month of April. Multitudes of these are destroyed by the vultures, and immense numbers of the young animals are devoured, as soon as they reach the water, by the various species of fish.

When taken young the alligator may in some measure be domesticated. Dr. Brickell saw one that was caught not long after being hatched, and put into a large pond before a planter's house. It remained near half a year, during which time it was regularly fed with the entrails of fowls and raw meat. It frequently came into the house, where it would remain for a short time, and then return again to its shelter in the pond. It was supposed at last to steal away to a creek near the plantation; for it was one day missing, and from that time was never afterwards found.

Some naturalists think the alligator to be only a variety of the crocodile, but others imagine it to be a distinct species.

## THE GUANA, or IGUANA.

THE tail of this animal, which is a native of the Bahama islands, is long and round, the back serrated, and the crest denticulated. The individuals vary greatly in color, but their prevailing tinge is a brownish green. Under the chin it has a pouch capable of great inflation; and it grows to four or five feet in length.

The guana commonly inhabits the rocks, but sometimes hides itself in cliffs or hollow trees. Its food is almost entirely confined to vegetables and insects, which it swallows whole; and the fat of the abdomen assumes the color of whatever the animal has last eaten. Its appearance is disgusting, and its motions very slow. Though not naturally amphibious, it will on necessity continue long under water; in swimming, it keeps its legs close pressed to its body, and urges itself forward by means of the tail.

The females usually quit the woods or mountains about two months after the end of winter, for the purpose of depositing their eggs in the sand of the sea shore. These eggs are always unequal in number, from thirteen to twenty-five. They are longer, but not thicker than pigeons' eggs; the outer covering is white and flexible. Most travellers say that these eggs give an excellent relish to sauces, and that their taste is preferable to that of poultry eggs. Indeed, the flesh of the animals themselves constitutes a principal support of the natives of the Bahamas, who go out in their sloops to other islands to take them, which they do by means of dogs trained for the purpose. They are also hunted by negroes. " A negro," says Father Labat, who was present when one was taken, " carried a long rod, at one end of which was fastened a piece of whipcord, with a running knot. After beating the bushes for some time, the negro discovered our game, basking in the sun, on the dry limb of a tree. On this he began whistling with all his might, to which the guana was wonderfully attentive, stretching out his neck, and turning his head, as if to enjoy it more fully. The negro now approached, still whistling, and, advancing his rod gently, began tickling with the end of it the sides and throat of the guana, which seemed mightily pleased with the operation, for he turned on his back, and stretched himself out like a cat before the fire, and at length fairly fell asleep. The negro perceiving this, dexterously slipped the noose over his head, and with a jerk brought him to the ground." See the annexed plate.

As soon as these animals are caught their mouths are sewed up, to prevent them from biting, and some are carried alive from hence to Carolina for sale; others are salted and barrelled for home consumption. The flesh is sometimes roasted, but more usually boiled, the fat being first taken out, which the natives melt and clarify.

This animal may be easily domesticated if taken young. A full grown one was kept by Dr. Browne, about his house, for more than two months. At first it was very fierce and ill-natured, but after some days it grew more tame, and would at length pass the greatest part of the day on the bed or couch, but it always went out at night. As it walked along it frequently threw out its forked tongue; but, during all the time he had it, he never observed that it ate any thing.

## *THE NIMBLE LIZARD.*

THE general length of this animal is, from the nose to the end of the tail, about six inches and a half. The upper part of the head is light brown, and the back and tail are variously striped and spotted with light brown, black, white, and dark brown; the under parts of the body are of a dirty white. The tail is nearly twice the length of the body, and tapers from the root to the extremity, where it ends in a sharp point. This, from the weakness of the vertebræ, is so brittle as often to snapp off on the least roughness in handling; in this case it is sometimes reproduced. When the tail has been split or divided lengthways, it has been known that each of the portions, in healing, has rounded itself, and thus the animal has had a double tail; one of these has contained the vertebræ, and the other only a kind of tendon in the centre.

The nimble lizard is one of the British species, which seems to be the most gentle and inoffensive, and, at the same time, the most useful of all the tribe. Its motions are so agile, and it runs with such swiftness, as, when disturbed, to disappear in a moment. It is fond of basking in the sun, yet, unable to bear excessive heat, in the hottest weather it seeks shelter. In spring, during fine weather, it is often seen luxuriously extended on a sloping green bank, or on a wall exposed to the sun. In these situations it enjoys the full effects of the reviving heat, expressing its delight by gently agitating its slender tail, and its lively and brilliant eyes are animated with pleasure. Should any of the minute animals appear on which it feeds, it springs upon them with amazing quickness; and if any danger occur, it seeks a more secure retreat with equal rapidity. On the least noise it turns suddenly round, falls down, and seems for some moments perfectly stupified by its fall, or else it suddenly shoots away among the bushes or thick grass, and disappears. Its wonderful rapidity of motion is chiefly to be observed in warm countries, its evolutions being much more languid in the temperate regions.

This elegant little animal excites no sensations of terror; it is very gentle, and when taken into the hand makes not the smallest attempt to bite or offend. In some countries children use it as a play-thing; and, in consequence of its natural gentleness of disposition, it becomes, in a great measure, tame and familiar. But occasionally it seems to lay aside this gentleness and innocence of disposition, no further, however, than for the purpose of obtaining food. Mr. Edwards once surprised one of them in the act of fighting with a small bird, as she sat on her nest in a vine against the wall, with newly-hatched young. He supposed the lizard would have made them a prey, could he but have driven the old bird from her nest; he watched the contest for some time, but, on his near approach, the lizard dropped to the ground, and the bird flew off.

In order to seize the insects on which it feeds, this creature darts out, with astonishing velocity, its large forked tongue, which is of a reddish color, and beset with asperities that are scarcely sensible to the sight, but which assist very materially in catching its winged prey. Like most other oviparous quadrupeds, it is capable of existing a long time without food. Some of them have been kept upwards of six months in bottles, without any nourishment.

In the beginning of May the female deposits her eggs, which are nearly spherical, and about five lines in diameter, in some warm situation; as, for instance, at the foot of a wall fronting the south: here they are hatched by the heat of the sun. Previously to laying the eggs, both male and female change their skins, which they again do about the beginning of winter. They pass that season in a state of torpor, more or less complete, according to the rigor of the season, either in holes of trees, or walls, or subterraneous places. They quit these retreats on the first appearance of spring. In the southern countries of Europe they revive very early in the spring from the torpid state in which they had passed the cold weather of the winter; and, recovering their activity, begin their sportive evolutions, which increase in agility in proportion to the heat of the atmosphere.

## *THE CAMELEON.*

THE head of a cameleon is almost like that of a fish, it being joined to the breast by a very short neck, covered on each side with cartilaginous membranes resembling the gills of fish. There is a crest directly on the top of the head, and two others on each side above the eyes, and between these there are two cavities near the top of the head; the muzzle is blunt, and not much unlike that of a frog; at the end there is a hole on each side for the nostrils, but there are no ears, nor any sign of any. The length of its body is about ten inches, and that of the tail, which is cylindrical, nearly the same. In figure it is extremely ugly and disgusting, yet in disposition perfectly harmless, feeding only on insects, for which the structure of its tongue is peculiarly adapted, being long and missile, and furnished with a dilated, glutinous, and somewhat tubular tip. By means of this it seizes insects with the greatest ease, darting it out, and instantaneously retracting it, with the prey secured on its tip, which it swallows whole. The jaws are furnished with teeth, or rather with a bone in the form of them, which the animal makes little or no use of. The skin is covered with small warts or granulations, and down the middle of the back it is serrated. The feet have five toes united three and two, to enable it to lay firm hold of the branches of trees, in which it principally resides; and to this end also its tail is prehensile, and is always coiled round the branch till the animal has secured a firm footing. Its motions are very slow. The lungs are so large as to allow it to inflate the body to a vast size. The structure and motions of its eyes are singular; these are large and globular, and so formed that at the same instant it can look in different directions. One of them may frequently be seen to move when the other is at rest; or one will often be directed forwards, while the other is attending to some object behind, or in the same manner upwards or downwards.

The cameleon is a native of India, Africa, and some of the warmer parts of Spain and Portugal. It is principally celebrated for its singular property of occasionally changing its color. Various writers have given various accounts of it. Mr. Hasselquist says, that he never observed the cameleon assume the color of an external object presented to its view, although he made several experiments for the purpose. Its natural color, he asserts, is an iron grey, or black, mixed with a little grey. This it sometimes changes, and becomes entirely of a brimstone yellow, which, except the former, is the color it most frequently assumes. It sometimes take a darker or greenish yellow, and sometimes a lighter. He did not observe it assume any other colors, such as blue, red, purple, &c. When changing from black to yellow, the soles of its feet, its head, and the bag under its throat, were the first tinged, and then by degrees that color spread over the rest of the body. He several times saw it marked with large spots of both colors all over its body, which gave it an elegant appearance. When it became of an iron grey it dilated its skin, and became plump and handsome; but as soon as it turned yellow, it contracted itself, and appeared empty, lean, and ugly; and the nearer it approached in color to white, the more empty and ugly it appeared; but its shape was always the most unpleasant when it was speckled. This gentleman kept a cameleon for near a month; it was, during the whole time, very nimble and lively, climbing up and down its cage, fond of being near the light, and constantly rolling about its large eyes. It took no food during the whole of this time, so that at last it became lean, and evidently suffered from hunger. It could no longer hold fast by the grating of the cage, but fell through weakness, when a turtle, that was in the same room, bit it and hastened its death. From this animal's being able to support long abstinence, has arisen the vulgar notion of the cameleon's living only on air.

Dr. Russel informs us, that when the cameleon is removed from its place, it does not immediately change color, nor does it constantly, in changing, assume that of the ground upon which it is laid. "Thus," adds our author, "if put into a box lined with white, or with black, it will sometimes in the black become of a lighter color than before, and *vice versa;* and sometimes will assume a brimstone color. When the experiment was made upon a cloth of various colors, but where the animal had a larger field to move about, the event was the same. It frequently goes through a succession of colors before taking that of the body nearest to it. When laid on the grass it will, perhaps from a light earthy color, first become darker, then black, yellow, and last of all green. At other times it becomes green at once, and so of other colors when laid on other grounds; whence it has been hastily conjectured that the transition was always sudden. But, notwithstanding this irregularity in its change, especially when hurried or disturbed, its most permanent color, in repose, was that of the ground on which it lay; provided the ground was not one of the colors that it never does assume, of red or blue. Little material difference was observable, whether the experiments were made in the shade or in the sun; but the animal appears duller at some times than others, and captivity seems to abate its alacrity in changing."

D'Obsonville is of opinion that the color of the cameleon is naturally green, that it is susceptible of many shades, and particularly of three very distinct ones; Saxon green, deep green, and a shade bordering on blue and yellow green. When free, in health, and at ease, it is a beautiful green, some parts excepted, where the skin, being thicker and more rough, produces gradations of brown, red, or light grey. When the animal is provoked, in open air, and well fed, it becomes blue-green; but when feeble, or deprived of free air, the prevailing tint is the yellow-green. Under other circumstances, and especially at the approach of one of its own species, no matter of which sex, or when surrounded and teased by a number of insects thrown upon him, he then, almost in a moment, takes alternately the three different tints of green. If he be dying, particularly of hunger, the yellow is at first predominant; but in the first stage of putrefaction this changes to the color of dead leaves. "It seems," adds this author, "that the causes of these different varieties are several; and first, the blood of the cameleon is of a violet blue, which color it will preserve for some minutes on linen or paper, especially on such as have been steeped in alum water. In the second place, the different tunicles of the vessels are yellow, as well in their trunks as in their ramifications. The epidermis, or exterior skin, when separated from the other, is transparent, without any color; and the second skin is yellow, as well as all the little vessels that touch it. Hence it is probable that the change of color depends upon the mixtures of blue and yellow, from which result different shades of green. Thus, when the animal, healthy and well fed, is provoked, its blood is carried in greater abundance from the heart towards the extremities; and, swelling the vessels that are spread over the skin, its blue color subsides the yellow of the vessels, and produces a blue green that is seen through the epidermis. When, on the contrary, the animal is impoverished and deprived of free air, the exterior vessels being more empty, their color prevails, and the animal becomes a yellow-green till it recovers its liberty, is well nourished, and without pain, when it regains the color; this being the consequence of an equilibrium in the liquids, and of a due proportion of them in the vessels."

These different relations respecting the different colors of the cameleon, reminds us of the celebrated fable of the Cameleon; like the disputants in that fable, probably at the sight of this animal these gentlemen would also be inclined to change their opinions.

Previously to the cameleon's assuming a change of color it makes a long inspiration, the body swelling out to twice its usual size; and, as this inflation subsides, the change of color gradually takes place. The only permanent marks are two small dark lines passing along the sides.

## *THE SALAMANDER.*

THIS animal has a short cylindrical tail, four toes on the fore feet, and a naked porous body. The color is a deep shining black, variegated with large, oblong, and somewhat irregular patches of bright orange yellow. Its eyes are placed in the upper part of the head, which is a little flatted; their orbit projects into the interior part of the palate, and is there almost surrounded by a row of very small teeth, like those in the jaw bones; these teeth establish a near relation between lizards and fish, many species of which have also several teeth placed in the bottom of the mouth. The color is very dark; upon the belly it has a bluish cast, intermixed with pretty large irregular yellow spots, which extend over the whole body, and even to the feet and eye-lids; some of these spots are besprinkled with small black specks, and those which are upon the back often touch without interruption, and form two long yellow bands. The color, however, must be subject to vary, as it appears that some salamanders are found in the marshy forests of Germany, which are quite black above and yellow below. To this variety we must refer the black salamander found by Mr. Laurenti in the Alps, which he considered as a distinct species.

This animal has no ribs any more than frogs, to which it has a great resemblance in the general form of the anterior part of its body. When touched, it suddenly covers itself with a kind of a transparent coat of varnish, formed by something like milk, which oozes from a number of excrescences or teats, containing a great many holes; and it can also very rapidly change its skin from a state of humidity to a state of dryness. The milk which issues from the small holes in its surface is very acrid; when put upon the tongue one feels as it were a kind of scar at the part which it touched. This milk, which is considered as an excellent substance for taking off hair, has some resemblance to that which distils from those plants called esula and euphorbium. The general length of the salamander is seven or eight inches, though sometimes it becomes much longer. It is found in many parts of Germany, Italy, and France. When crushed, or only pressed, this animal exhales a bad smell, which is peculiar to it.

The ancients, for what reason it would be difficult to say, attributed to the salamander the property of being able to live in the fire; but what is more extraordinary, the same circumstance is seriously detailed as a fact in the Philosophical Transactions. This species is found in most of the southern countries of Europe, and of which the Comte de la Cepede has given the most accurate account. "Whilst the hardest bodies cannot resist the violence of fire, the world have endeavored to make us believe that a small lizard can not only withstand the flames, but even extinguish them. As agreeable fables readily gain belief, every one has been eager to adopt that of a small animal so highly privileged, so superior to the most powerful agent in nature, and which could furnish so many objects of comparison to poetry, so many pretty emblems to love, and so many brilliant devices to valor. The ancients not only believed this property of the salamander, but wishing that its origin might be as surprising as its power, and being desirous of realizing the ingenious fictions of the poets, they have pretended that it owes its existence to the purest of elements, which cannot consume it; and they have called it the *Daughter of Fire*, giving it, however, a body of ice. The moderns have followed the ridiculous tales of the ancients; and, as it is difficult to stop when one has passed the bounds of probability, some have gone so far as to think that the most violent fire could be extinguished by the land salamander. Quacks sold this small lizard, affirming, that if thrown into the greatest conflagration it would check its progress. It was very necessary that philosophers and naturalists should take the trouble to prove by facts what reason alone might have demonstrated; and it was not till after the light of science was diffused abroad, that the world gave over believing in this wonderful property of the salamander."

The salamander has been also esteemed a poisonous reptile, and consequently held in terror; but this opinion has been refuted by numerous experiments. M. de Maupertuis, who minutely studied the nature of this lizard, in order to discover what might be its pretended poison, demonstrated also experimentally that fire acted upon it in the same manner as upon all other animals. He remarked, that it was scarcely upon the fire before it appeared to be covered with drops of a kind of milky fluid, which oozed through all the pores of the skin, and immediately became hard. It is needless to say that this fluid is not sufficiently abundant to extinguish even the smallest fire; it possesses some degree of acridity, for, when put upon the end of the tongue, it causes an unpleasant burning sensation.

These animals usually resort in shady woods, high mountains, or the banks of unfrequented rivulets; and they are not often seen except during wet weather. In the winter they lie concealed in hollows about the roots of old trees, in subterraneous recesses, or the cavities of old walls, where several of them have been sometimes discovered, collected, and twisted together. They are often to be seen in the water, where they are able to live as well as on land. Their principal food is insects, beetles, snails, &c. Their pace is slow, often appearing to drag themselves with great difficulty along the surface of the earth. They dread the heat of the sun. Their young are brought into the world alive, having been first hatched from eggs within the parent animal. The females are said to retire to the water to deposit them: at their first exclusion from the body, these are furnished with fins on each side of the neck, which, on the animal's becoming perfect, drop off. The number of young produced by one salamander is said sometimes to amount to thirty or forty; and the young ones are generally of a black color, almost without spots.

## THE WARTY LIZARD

IS six or seven inches in length, and entirely covered, except on the belly, with small warts. The under parts are of a bright yellow color, and the upper mostly of a black brown, spotted with black. It is very common in this country, where it resides altogether either in the water, or in very damp places, and its tail being flattened perpendicularly, serves it as a rudder in swimming. It is usually seen crawling along the bottom, but it now and then rises, with a wriggling motion, to the surface.

Being never seen in winter, these lizards are supposed to retire into holes or mud, and become torpid. They deposit their spawn towards the end of May or beginning of June, in small clusters, consisting of several palish yellow-brown globules included in surrounding gluten. The larvæ are furnished with fins on each side of the breast, which fall off when the animals attain a perfect state.

These animals, like many other reptiles, change their skins at certain periods. This operation is generally performed at the end of every fortnight or three weeks. A day or two before the change Mr. Baker, who kept some of them in a large jar of water for many months, observed "that the animal always appeared more sluggish than usual, taking no notice of the worms that were given to it, which at other times it greedily devoured. The skin in some parts of the body appeared loose, and its color not so lively as before. It began the operation of casting the skin by loosening that part about the jaws; it then pushed it backward gently and gradually, both above and below the head, till it was able to slip out first one leg and then the other; with these legs it proceeded to thrust the skin as far backwards as they could reach. This done, it was under the necessity of rubbing its body against the gravel till it was more than half freed from the skin, which appeared doubled back, covering the hinder part of the body and the tail. The animal now bent back its head, taking the skin in its mouth, and, setting its feet upon it for firmer hold, by degrees drew it entirely off, the hind legs being dragged out in the same manner that the fore ones were before. On examining the skin it was, in every instance, found to be turned with its inside outwards, but without any breach except at the jaws. These creatures do not, however, like some of the snakes, put off the coverings of the eyes along with the skin, for two round holes always appear where the eyes have been.

" This operation sometimes occupies near half an hour, and after it is finished the lizard appears full of life and vigor. If the skin is not taken away very shortly after it is cast, the animal usually swallows it whole, as it does other food.

Sometimes it begins with the head part first; and the tail being filled with air and water, becomes like a blown bladder, and proves so unmanageable, that it is very diverting to see the pains it costs to discharge these, and to reduce it to a condition to be got down the throat."

We are informed by Dr. Townson, who had several of these lizards in a jar for the purpose of trying experiments on their respiration, that he fed them with worms, and that if they were in the greatest stilness, and a worm was dropped ever so gently among them, they all immediately began to fight, each attacking his neighbour, and seizing it by the head, foot, or tail. This he remarked to be "not a contention immediately for the worm, for that often lay for a short time unnoticed, but it seemed to originate in a great acuteness of smell, (which in a moment informed them of the presence of their food,) and in a singular dulness of their discriminating powers."

## *THE GREEN LIZARD.*

THE common green lizard is a native of both Europe and India. This species is also extremely nimble; it basks on the sides of dry banks, or under old trees in hot weather, but, on being observed, immediately retreats to its hole. The food of this, as well as of all other British lizards, is insects, and they themselves are devoured by birds of prey. They are all perfectly harmless, yet their form strikes almost every beholder with disgust, and has occasioned great obscurity in their history. Mr. Pennant mentions a lizard killed in Worcestershire in the year 1714, which was two feet six inches long, and four inches in girth; the fore legs were placed eight inches from the head, the hind legs five inches behind those; the legs were two inches long; and the feet divided into four toes, each furnished with a sharp claw. Another of the same kind was afterwards killed in that county; but whether these large lizards were natives of other countries, and imported into England, or whether they were of British growth, is uncertain; though the former is more probable, as in this country they scarcely ever exceed six inches. This species has a pretty long verticillated tail, with sharp scales, and a scaly collar.

The green lizard of Carolina is so denominated from its color; it is very slender, the tail nearly double the length of the body, and the whole length above five inches. It inhabits Carolina, where it is domestic, familiar, and harmless. It sports on the tables and windows, and amuses with its agility in catching of flies. Cold affects its colors; in that uncertain climate, when there is a quick transition in the same day from hot to cold, it changes instantly from the most brilliant green to a dull brown. They are a prey to cats and ravenous birds. They appear chiefly in summer, and at the approach of cold weather, they retire to their winter recesses, and lie torpid in the holes and crevices of hollow trees. It frequently happens, that a few warm sunshiny days so invigorate them, that they will come out of their holes, and appear abroad; when on a sudden the weather changing to cold, they become so feeble as to be unable to return to their retreats, and consequently expire.

## CHAP. II.

"Toad that under the cold stone
Days and nights has thirty-one
Swelter'd venom sleeping got,
Boil thou first i' th' charmed pot."

SHAKESPEAR.

## THE TOAD.

THIS animal, which is easily recognised by its livid appearance and sluggish and disgusting movements, is, in figure, nature, and appetites, like the frog. In Europe it is of a considerable size, the smallest individuals measuring six inches in length. Its eyes are remarkably beautiful, having a brilliant reddish gold-colored iris surrounding the dark pupil, and forming a a striking contrast with the remainder of its body.

These animals are so extremely numerous in Carthagena and Porto Bello in America, that, in rainy weather, not only all the marshy grounds, but the gardens, courts, and streets are almost covered with them; so much so that many of the inhabitants believe that every drop of rain is converted into a toad. If it happen to rain during the night, all the toads quit their hiding places, and then crawl about in such numbers, as almost literally to touch each other, and hide the surface of the earth; on such occasions it is impossible to stir out of doors without trampling them underfoot at every step.

When irritated, this creature emits from various parts of its skin a kind of frothy fluid that, in our climate, produces no further unpleasant symptoms than slight inflammation, from its weakly acrimonious nature. Dogs, on seizing these animals, appear to be affected with a slight swelling in their mouth, accompanied by an increased evacuation of saliva. The limpid fluid which the toad suddenly ejects from his body when disturbed, has been ascertained to be perfectly free from any noxious qualities whatever; it is merely a watery liquor, the contents of a peculiar reservoir, that, in case of alarm, appears to be emptied in order to lighten the body, that the animal may the more readily escape. It is its extremely forbidding aspect only that has obtained for this creature its present unjust character of being a dangerously poisonous animal. It is persecuted and murdered wherever it appears, on the supposition merely that because it is ugly it must in consequence be venomous; and its reputation as a poisonous animal obtained for it among the superstitious so many preternatural powers, that the reputed dealers in magic art are reported to have made much use of it in their compounds.

The female toads deposit their spawn early in the spring, in the form of necklace-like chains or strings of beautifully transparent gluten, three or four feet in length, inclosing the ova in a double series throughout. These have the appearance of so many jet-black globules; they are, however, nothing more than the larvæ, or tadpoles, lying in a globular form. These break from their confinement in about a fortnight, and afterwards undergo changes very similar to the tadpoles of the frog. They become complete about the beginning of autumn, when the young animals are frequently to be seen in immense multitudes.

These animals, singular as it may appear, can be rendered so very tame, that they may be taken in the hand, and carried about a room to catch the flies that alight on the walls. Mr. Pennant received from a correspondent some curious particulars of a domestic toad, which frequented the steps before the hall door of a gentleman's house in Devonshire. By being constantly fed it became so free, as always to come out of its hole in an evening when a candle was brought, and look up, as if expecting to be carried into the house, where it was frequently fed with insects. An animal that is so generally detested being so much noticed and befriended, excited the curiosity of all who came to the house; and even young ladies so far conquered the horrors instilled into them by their nurses, as generally to request to see it fed. It appeared most partial to flesh maggots, which were kept for it in bran. It would follow them on the table, and, when within a proper distance, would fix its eyes and remain motionless for a little while, apparently to prepare for the stroke, which was instantaneous. It threw out its tongue to a great distance, and the insect stuck by the glutinous matter to its tip, and was swallowed by a motion quicker than the eye could follow. This it was enabled to do from the root of the tongue being attached to the fore-part of the mouth, and lying, when at rest, with the tip towards the throat. After being kept above *thirty-six* years, it was at length destroyed by a tame raven, which one day seeing it at the mouth of its hole, pulled it out, and so wounded it, that it died soon afterwards.

It has been said, that whenever a spider and toad meet, a contest always takes place, in which, from its superior dexterity and address, the former often proves victorious. However true this may be with respect to foreign spiders and toads, it is not the case with ours.

Living toads have been discovered in blocks of stone and the solid trunks of trees. M. Lecat, in order to account for this extraordinary phenomenon, says that some philosophers have been of opinion that the eggs of these animals created at the beginning of the world, and floating about on the watery expanse, have since that time continued inclosed in the interior parts of rocks; but he contradicts this opinion by remarking that the creation of an egg is not sufficient, and that it must be hatched in order to produce a living creature. He considers it also as impossible that such animals can be as old as the stones or substances in which they are found; and rather thinks that a hatched egg, in all the cases mentioned, may have fallen by chance into some small cavity where it was secured from petrifaction. He remarks that eggs, when rubbed over with varnish, so as to be defended from the effects of the air, may be preserved fruitful for years; and, therefore, believes that an egg so secured in the centre of a rock might retain its activity for thousands of years; hence he concludes that the egg is of great antiquity, but not the animal. When we consider, however, the solidity of the substances in which these living toads have been found, as has been proved by indisputable authorities, we may ask, where could these small cavities be, leading to the centre of the rock, into which a hatched egg could have fallen?

## THE PIPA.

THIS animal, which at first view appears extremely hideous and deformed, is considerably larger than the common toad, has a flattish body, and a somewhat triangular head. The mouth is very wide, and furnished at the edges or corners with a kind of cutaneous appendage. The forefeet have four long and thin toes, each divided at the tip into four distinct parts, which, when inspected with a magnifier, are found to be each again obscurely subdivided almost in a similar manner: the hind feet have five toes united by a web.

The pipa is a native of Surinam, ; and, according to Ferman, is only calculated for having but one breed ; the number of young produced by a female which he observed was seventy-five ; and they were all perfect in the space of five days after their first appearance. In the production of its young this creature affords a very singular deviation from the usual course of nature, and therein seems to bear considerable analogy to the different species of opossum. On the back of the female are formed certain cavities, opening outward, and somewhat resembling the cells of a bee-hive; they are of a circular form, about half an inch deep, and each nearly a quarter of an inch in diameter. They are at a little distance from each other, and somewhat irregularly ranged.

At a certain period of incubation, if it may be so called, in each of these shells is found a little live toad, an exact miniature in all respects of its parent; but how it finds subsistence there (for the creature has no adhesion to the parent, but may be easily taken out, as from a case, and again replaced without injury) does not seem as yet to be fully ascertained. Mr. Ferman, who has described this animal, declares himself to have been an eye-witness to the procedure. The eggs are generated within the female, who, when they have attained the proper degree of maturity, deposits them on the ground. The male amasses together the heap, and deposits them with great care on the back of the female, where, after impregnation, they are pressed into the cellules, which are at that period open for their reception, and afterwards close over them. The ova remain in the cellules till the second birth, which takes place in somewhat less than three months, when the young emerge from the back of the parent completely formed. During the time of concealment they undergo the usual change of the rest of the genus into the tadpole state, which they entirely put off before their final extrusion. The flesh of the pipa, (according to Madame Merian,) is highly relished by the negroes of Surinam; and as they never find any inconvenience from it, it cannot therefore be deemed unwholesome.

## THE FROG.

THE color of the common frog is olive brown, variegated above with irregular blackish spots. Beneath each eye there is a patch or mark that reaches to the setting on of the fore legs. Its appearance is lively, and its form on the whole by no means inelegant. The body is not covered with either plates or scales, but is entirely naked. It has a sternum or breast-plate, but no ribs, and is also destitute of a tail. The limbs are well calculated for aiding the peculiar motions of the animal; it has four feet, and its webbed hind feet, which are longer than the others, assist its progress in the water, to which it occasionally retires during the heats of summer, and again in the frosts of winter. During the latter period, and till the return of warmer weather, it lies in a state of torpor, either deeply plunged in the soft mud at the bottom of stagnant waters, or in the hollows beneath their banks. The mode of respiration in these animals, in common with many of the other reptiles, is exceedingly curious. The organs adapted to this use are not placed in the belly, nor in the lungs themselves, but in the mouth. Behind the root of the tongue is the slit-like opening of the trachea; and at the front of the upper part of the head are two nostrils, through which the animal always draws the air, never opening its mouth for this purpose. Indeed the jaws during this action are kept closely locked into each other by grooves; for if the mouth be kept open it cannot respire at all, and the animal will presently be seen struggling for breath. When observed carefully, a frequent dilatation and contraction may be seen in the skinny bag-like part of the mouth which covers the under jaw. From this it would appear, at first sight, as if the creature lived all the while on one mouthful of air, which it seems to be playing backwards and forwards betwixt its mouth and lungs; but for each movement in the jaw a corresponding twirling movement may be observed in the nostrils. The mouth seems therefore to form a sort of bellows, of which the nostrils are the air-holes, and the muscles of the jaws by their contraction and dilatation make the draught. The nostrils are so situated that the least motion on them enables them to perform the office of a valve. By the twirl of the nostril the air is let into the mouth, when a dilatation of the bag takes place; it is then emptied from the mouth, through the slit behind the tongue, into the lungs, where there is a slight motion in the sides of the animal, and the muscles of the abdomen again expel it; and soon afterwards a second twirl in the nostrils takes place, and the like motions follow. Thus it appears that the lungs are filled by the working of the jaws, or, in other words, that frogs swallow air much in the same manner that we swallow food.

These animals are oviparous, and its spawn, which is generally in the month of March, consists of a clustered mass of gelatinous, transparent, and spherical eggs, from six hundred to a thousand in number, in the middle of each of which is contained the embryo or tadpole, (which is without feet, but furnished with a tail to aid its motions in the water,) in the form of a black globule. The spawn lies a month or five weeks, according to the heat of the weather, before the larvæ or tadpoles are hatched. These, as in several other species, are furnished with a kind of small tubular sucker beneath the lower jaw, by means of which they hang at pleasure to the under surface of aquatic plants. The interior organs, when closely examined, are found to differ in many respects from those of the old frog. The intestines, in particular, are coiled into a flat spiral form, somewhat resembling a cable in miniature. When the animal is about six weeks old, the hind legs appear, and in about a fortnight these are succeeded by the fore legs; in this state it seems to have an alliance both to the frog and lizard. Not long afterwards the form is completed, and it, for the first time, ventures upon land. Frogs are at this period often seen wandering about the brinks of the water in such immense multitudes, as to induce a belief among the vulgar, of their having descended in showers from the clouds.

Mr. Ray, in his " Wonders of the Creation," informs us that, as he was riding one afternoon in Berkshire, he was much surprised at seeing an immense multitude of frogs crossing the road. On further examination he found two or three acres of ground nearly covered with them ; they were all proceeding in the same direction towards some woods and ditches that were before them. He, however, traced them back to the side of a very large pond, which, in spawning time, he was told always abounded so much with frogs, that their croaking was frequently heard to a great distance ; and he therefore naturally concluded, that instead of being precipitated from the clouds, they had been bred there, and had been invited by a refreshing shower, which had just before fallen, to go out either in pursuit of food or of a more convenient habitation.

As soon as the young acquire their complete form, they surrender their vegetable food for the smaller species of snails, worms, and insects; and the structure of their tongue is admirably adapted to seize and secure this prey; the root is attached to the fore-part of the mouth, so that, when unemployed, it lies with the tip towards the throat. The animal, by this singular contrivance, is enabled to bend it to a considerable distance out of its mouth. When it is about to seize on any object, it darts out with great agility, and the prey is secured on its broad and jagged glutinous extremity. This it swallows with so instantaneous a motion that the eye can scarcely follow it: but, when engaged with a small snake or large worm, nothing can appear more awkward and ludicrous, for nature seems to have put a restraint upon the voracity of these animals, by forming them very inaptly for seizing and holding their larger prey. Dr. Townson had a large frog that one day swallowed in his presence a worm near a span long, which in its struggles frequently got half its body out again: when completely swallowed, its contortions were very visible in the flaccid sides of its conqueror.

Frogs are numerous in the parts of America about Hudson's Bay, as far north as latitude sixty-one degrees. They frequent there the margins of lakes, ponds, rivers, and swamps, and, as the winter approaches, they burrow under the moss, at a considerable distance from the water, where they remain in a frozen state till spring. Mr. Hearne has frequently seen them dug up with the moss frozen as hard as ice. In this state their legs are as easily broken off as the stem of a tobacco-pipe, without giving them the least sensation; but by wrapping them up in warm skins, and exposing them to a slow fire, they soon come to life, and the mutilated animals gain their usual activity; if, however, they are permitted to freeze again, they are past all recovery.

These animals cast their skins at certain periods. They arrive at full growth in about five years, and are supposed to live to twelve or fifteen. Their voice is hoarse and unpleasant, which in some countries has procured them the ludicrous title of Dutch nightingales; and they are so tenacious of life as to survive even the loss of their head for several hours. The hind legs of the common frog are sometimes eaten, and the fore-legs and livers often form an ingredient in the Continental soups.

The edible frog, however, which is considerably larger than the common species, is in greater request for food, being whiter, and altogether more palatable. Its color is an olive green, distinctly marked with black patches on the back, and on its limbs with transverse bars of the same. From the tip of the nose three distinct stripes of pale yellow extend to the extremity of the body, the middle one slightly depressed, and the lateral ones considerably elevated. The under parts are of a pale whitish color tinged with green, and marked with irregular brown spots. It is by some called the green frog, and though not common in England, is found in great plenty in Italy, France, and Germany.

This species seldom deposits its spawn before the month of June. During this season the male is said to croak so loud as to be heard to a great distance. In some particular places, where these animals are numerous, their croaking is very oppressive to persons unaccustomed to it. The globules of spawn are smaller than those of the common frog, and the young are considerably longer in attaining their complete state, this seldom taking place till November. They arrive at their full growth in about four years, and live to the age of sixteen or seventeen. They are excessively voracious, frequently seizing young birds, and even mice, which, like the rest of their prey of snails, worms, &c. they swallow whole.

Edible frogs are brought from the country, thirty or forty thousand at a time, to Vienna, and sold to the great dealers, who have conservatories for them, which are large holes, four or five feet deep, dug in the ground, the mouth covered with a board, and in severe weather with straw. In these conservatories, even during a hard frost, the frogs never become quite torpid; when taken out and placed on their backs, they are always sensible of the change, and have strength enough to turn themselves. They get together in heaps, one upon another, instinctively, and thereby prevent the evaporation of their humidity, for no water is ever put to them. In Vienna, in the year 1793, there were only three great dealers, by whom most of those persons were supplied who brought them to the market ready for the cook. As their spawning time is so very late in the year, those animals that are brought to market before the month of June for edible frogs, are supposed to be either common frogs, or sometimes toads.

The large water, or bull frog, is also edible, having as much meat on them as a young fowl. It frequently measures from the nose to the hind feet a foot and a half, or upwards. Its color is a dusky olive or brown, marked with numerous dark spots, lighter beneath than above. The external membranes of the ears are large, round, and of a brownish red, surrounded by a yellowish margin. This species is chiefly found in the interior parts of America, where, at the springs or small rills, they are said to sit in pairs. Kalm, however, says that they frequent only ponds and marshes. In Virginia they are in such abundance, that there is scarcely a single spring that has not a pair of them. The inhabitants, who respect them as genii of the fountains, imagine that they purify the water. The women, however, are no friends to them, because they kill and eat young ducks and goslings; and sometimes they carry off chickens that venture too near the ponds.

When suddenly surprised, by a long leap or two they enter their hole, at the bottom of which they lie perfectly secure. A full-grown bull frog will sometimes leap three yards. Kalm relates the following story respecting one of them. The American Indians are known to be excellent runners, being almost able to equal the best horse

BULL FROG.

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in its swiftest course. In order, therefore, to try how well the bull frogs could leap, some Swedes laid a wager with a young Indian that he could not overtake one of them, provided it had two leaps beforehand. They carried a bull frog, which they had caught in a pond, into a field, and burnt its tail. The fire, and the Indian who endeavored to get up to the frog, had together such an effect upon the animal, that it made its long leaps across the field as fast as it could. The Indian pursued it with all his might. The noise he made in running frightened the poor frog; probably it was afraid of being tortured with fire again, and therefore it redoubled its leaps, and by that means reached the pond, which was fixed on as their goal, before the Indian could overtake it. An engraved representation of this well authenticated anecdote, our reader will find accompanies this article.

This animal is called the bull frog on account of its croaking, which is said somewhat to resemble the hoarse lowing of a bull; and when, in a calm night, many of them are making a noise together, they may be heard to the distance of a mile and a half. The night is the time when they croak, and they are said to do it at intervals. In this act they are either hidden among the grass or rushes, or they are in the water, with their heads above the surface. Kalm informs us that, as he was one day riding out, he heard one of them roaring before him, and supposed it to be a bull hidden in the bushes at a little distance. The voice was indeed more hoarse than that of a bull, yet it was much too loud for him to conceive that it could be emitted by so small an animal as a frog, and he was in considerable alarm for his safety. He was undeceived a few hours afterwards, by a party of Swedes, to whom he had communicated his fears.

A few years ago some of this species were brought alive into this country. They remain in a torpid state under the mud during winter, and in spring commence their bellowings.

The tree frog, which is a native of America, France, Germany, Italy, and many other European regions, but never found in Britain, is small, and of a slender and very elegant shape. Its upper parts are green, and the abdomen is whitish, marked by numerous granules. The under surface of the limbs are reddish, and on each side of the body there is a longitudinal blackish or violet-colored streak. The body is smooth above, and the hind legs are very long and slender. At the end of each toe is a round, fleshy, concave apparatus, not unlike the mouth of a leech, by means of which the animal is enabled to adhere even to the most polished surfaces.

This animal during the summer months resides principally on the upper branches of the trees, where it wanders among the foliage in quest of insects. These it catches with great dexterity, stealing softly towards them as a cat does towards a mouse, till at a proper distance, when it makes a sudden spring upon them of frequently more than a foot in height. It often suspends itself by its feet, or abdomen, to the under parts of leaves, remaining thus concealed among the foliage. The skin of the abdomen is covered with small glandular granules of such a nature as to allow the animal to adhere as well by these as by the toes. It will even stick to a glass by pressing its belly against it.

About the end of autumn the tree frog retires to the waters, and lies concealed in a torpid state in the mud, or under the banks, till the spring, when, on the return of warm weather, it emerges like the rest of the genus to deposit its spawn in the water. At this period the male inflates its throat in a surprising manner, forming a large sphere beneath its head; it also exerts a very loud and sharp croak, that may be heard to a vast distance. The tadpoles become perfected about the beginning of August, and they soon afterwards begin to ascend the adjacent trees. At this time they are particularly noisy in the evenings on the approach of rain; therefore, if kept in glasses in a room, and supplied with proper food, they will supply the place of barometers by affording sure presage of changes of the weather.

One was kept by a surgeon in Germany for nearly eight years. He had it in a glass vessel, covered with a net, and during the summer he fed it with flies; but in winter it probably did not eat at all, as only a few insects with grass and moistened hay were put to it. During this season it was very lean and emaciated, but when the ensuing summer brought flies, it recovered its fat. However, it pined away by degrees in the eighth winter, on account, as supposed, of no insects whatever being to be had.

Tree frogs have been also kept by Dr. Townson, who had them in a window, and appropriated to their use a bowl of water, in which they lived. They soon grew quite tame; and to two that he had for a considerable length of time, and were particular favorites, the doctor gave the names of Damon and Musidora. In the evening they seldom failed to go into the water, unless the weather was cold and damp, in which case they would sometimes remain out a couple of days. When they were out of the water, if a few drops were thrown upon the board, they always applied their bodies as close to it as they could; and from this absorption through the skin, though they were flaccid before, they soon again appeared plump. A tree frog that had not been in the water during the night was weighed, and then immersed; after it had remained about half an hour in the bowl it came out, and was found to have absorbed nearly half its own weight of water. From other experiments, it was discovered that these animals frequently absorbed nearly their whole weight of water; and that, as was clearly proved, by the under surface only of the body. They will even absorb water from wetted blotting-paper. Sometimes they eject water with considerable force from their bodies, to the quantity of a fourth part or more of their own weight. Before the flies had disappeared in autumn, the doctor collected for his favorite tree frog, Musidora, a great quantity, as winter provision. When he laid any of them before her, she took no notice of them, but the moment he moved them with his breath, she sprung upon and ate them. Once, when flies were scarce, the doctor cut some flesh of a tortoise into small pieces, and moved them by the same means; she seized them, but the instant afterwards rejected them from her tongue. After he had obtained her confidence she ate from his fingers dead as well as living flies. Frogs will leap at a moving shadow of any small object; and, like toads, they will also soon become sufficiently familiar to sit on the hand, and be carried from one side of a room to the other, to catch flies as they settle on the wall. This gentleman accordingly made them his guards, at Gottingen, for keeping these troublesome creatures from his desert of fruit, and they performed their task highly to his satisfaction.

He has even seen the small tree frogs eat humble bees, but this was never done without some contest: they are in general obliged to reject them, being incommoded by their stings and hairy roughness; but in each attempt the bee is further covered with the viscid matter from the frog's tongue, and when thus coated it is swallowed with facility.

A battle between a tree frog and a snake was seen in the top of a mangrove tree, by one of the officers who was with Captain Stedman when he was sailing up one of the rivers of Surinam in a canoe. When the captain first perceived them, the head and shoulders of the frog were in the jaws of the snake, which was about the size of a large kitchen poker. This creature had its tail twisted round a tough limb of the mangrove, while the frog, which appeared about the size of a man's fist, had laid hold of a twig with his hind feet. In this position they were contending, the one for life, the other for his dinner, forming one straight line between the two branches, and thus they continued for some time, apparently stationary, and without a struggle. Still it was hoped that the poor frog might extricate himself by his exertions, but the reverse was the case. The jaws of the snake gradually relaxing, and by their elasticity forming an incredible orifice, the body and fore legs of the frog by little and little disappeared, till finally nothing more was seen than the hinder feet and claws, which were at last disengaged from the twig, and its formidable adversary drew it down its throat by suction. The frog passed some inches further down the alimentary canal, and at last stuck, forming a knob or knot at least six times as thick as the snake, whose jaws and throat immediately contracted, and resumed their former natural shape.

## CHAP. III.

In Arcady, grave authors write
There liv'd a *serpent*, the delight
Of an ingenuous child;
Proud of his kindness, the brave boy
Fed and caress'd it with a joy
Heroically mild.

HAYLEY.

The Psylli were an Afric clan
Of wond'rous power possest;
Fierce *snakes*, of enmity to man
They cou'd with ease divest.

IBID.

### *THE COMMON, or RINGED SNAKE.*

WE shall now treat of the second class of amphibious animals (serpents) according to the Linnæan order, whereof there are about two hundred and thirty species, only forty of which are poisonous. These differ from the harmless serpents in having long tubular fangs on each side of the head, calculated to convey the venom from the bag or receptacle at the base, into the wound made by the bite. The principal distinguishing rule in these tribes is, that the venomous serpents have only two rows of true or proper teeth (that is, such as are not fangs) in the upper jaw, whilst all others have four.

The Psylli of old were famous for charming and destroying serpents; and Cassauban says, that he knew a man who could at any time summon an hundred serpents together, and draw them into the fire; and that on a particular time, when a large one refused to obey, he only repeated his charm, and it came forward like the rest to submit to the flames.

A description of the most remarkable of both tribes, (the innoxious and poisonous,) together with occasional anecdotes and quotations from the best authors, illustrated with some engravings, shall form the present chapter.

The ringed, or black snake, which, as it is the most common, shall be the first considered, is the largest of English serpents, sometimes exceeding four feet in length. The neck is slender; the middle of the body thick; the back and sides covered with small scales; the belly with oblong, narrow, transverse plates; the color of the back and sides is of a dusky brown; the middle of the back marked with two rows of small black spots, running from the head to the tail; the plates on the belly are dusky; the scales on the sides are of a bluish white; the teeth are small and serrated, lying on each side of the jaw, in two rows. The whole species is perfectly inoffensive, taking shelter in dunghills, and among bushes in moist places, whence they seldom remove, unless in the midst of the day, in summer, when they are called out by the heat to bask themselves in the sun. If attacked they at first endeavor to escape, but if much pressed they begin to hiss, and put themselves into a threatening position, though incapable of doing mischief.

These snakes in winter conceal themselves, and become nearly torpid, re-appearing in spring, when they uniformly cast their skins. This is a process that they also seem to undergo in the autumn. About the middle of September Mr. White found in a field, near a hedge, the slough of a large snake, which seemed to have been newly cast. From circumstances it appeared as if turned wrong side outward, and as if it had been drawn off backward like a stocking or woman's glove. Not only the whole skin, but the scales, from the very eyes, were peeled off, and appeared in the head of the slough like a pair of spectacles. The reptile, at the time of changing his coat, had entangled himself intricately in the grass and weeds, so that the friction of the stalks and blades might promote this curious shifting of his exuviæ.

The female deposits her eggs in holes fronting the south, near stagnant waters; but more frequently in dunghills, in the form of a continued chain of ova, to the number of from twelve to twenty. These are about the size of the eggs of the blackbird, of a whitish color, and covered with a parchment-like membrane. The young ones are rolled up spirally within the middle of the fluid, which greatly resembles the white of a fowl's egg. They are not hatched till the spring following the time when they are laid.

The earliest time of the snakes making their appearance is in the month of March, from which period till the middle of May they are to be found in vast numbers on warm banks, in moist and shady places. From this time, probably on account of the great heat of summer, they are not so often seen. They prey on frogs, insects, worms, and mice; for the former of which they often go into the water, where they swim with great elegance. After a snake has devoured a tolerably large frog or a small bird, its prey will be seen to form a knot in its body; and it then becomes so stupid and inactive as easily to be caught. They are also said to be particularly fond of milk, so much so that they will occasionally creep into dairies to drink the milk from the vessels. It is even said that they will twine themselves round the legs of cows to reach their udders, and that they will sometimes suck them till the blood follows.

This snake can be in some degree domesticated. Mr. White knew a gentleman who had one in his house quite tame. Though this was usually as sweet in its person as any other animal, yet whenever a stranger, or a dog or cat entered, it would begin to hiss, and soon filled the room with an effluvia so nauseous as to render it almost insupportable.

A French snake, which is supposed to be of a species nearly allied to this, had been (says Bomare) so completely tamed by a lady, as to come to her whenever she called it, to follow her in her walks, writhe itself round her arms, and sleep in her bosom. One day, when she went in a boat to some distance up a large river, she threw the snake into the water, imagining that its fidelity would lead it to follow her, and that, by swimming, it would readily overtake the boat. The poor animal exerted all its efforts, but the current proving at that juncture unusually strong, owing to the advance of the tide, in spite of all its struggling to effect its purpose, it was borne down the stream, and was unfortunately drowned.

## *THE HOODED SNAKE.*

THERE are five or six kinds of this dreadful serpent, which is very common in many parts of India. The éyes are fierce, and full of fire; the head is rather small; and a little beyond it there is a lateral dilation of the skin, which is continued to the length of about four inches downwards, where it gradually sinks into the cylindrical form of the rest of the body, and which the animal is capable of extending at pleasure. It is generally about three or four feet long, and somewhat more than an inch thick, and is usually marked on the top by a very large and conspicuous patch resembling a pair of spectacles. Its common color is a pale rusty brown above, and beneath a bluish white, tinged with yellow. The tail tapers to a slender and sharply-pointed extremity.

This animal, when irritated or preparing to bite, raises up the fore part of its body, bends down its head, and seems, as it were, hooded by the expanded skin of the neck, whence it derives its name. Its bite is sometimes mortal in two or three hours, especially if the poison has penetrated the larger vessels or muscles. A dog bitten by one of them died in twenty-seven minutes; and another, larger, survived fifty-six minutes. A chicken died in less than half a minute, though others survived a couple of hours, depending probably on the heat of the weather, and the condition of the serpent at the time.

The hooded snake in India is carried about in a basket to be publicly exhibited as a show, being first deprived of its fangs to secure the men from the danger of its bite. At the sound of a flageolet it is taught to assume a kind of dancing attitude and motions, which it continues as long as its master continues his music.

From its frequently moving along with great part of its body erect, and with its head in continual action, as if looking around with great circumspection, this species is by the Indians esteemed the emblem of prudence. It is also an object of superstitious veneration among the Gentoo Indians, founded on some traits of legendary mythology: they seldom name it without adding some epithet, such as the royal, the good, the holy, &c.

## THE BLACK SNAKE.

THIS species, which is a North American serpent, is very smooth and slender, black on the upper parts, and of a pale blue beneath, except the throat, which is white. It generally grows to six feet long, but possesses no poisonous qualities. It is remarkably active, as it will in speed equal a horse. Its different motions are very diverting. It will at times climb the trees in quest of the tree frogs; or, for other prey, glide at full length along the ground. On some occasions it presents itself half erect, and in this posture its eyes and head appear to great advantage. The former display a fiery brightness, by means of which they are able, it is said, to fascinate birds, and the smaller quadrupeds, in a manner similar to the rattle-snake, which we shall hereafter mention. Its body is also said to be so brittle, that if, when pursued, they get their head into a hole, and a person seize hold of the tail, this will often twist itself to pieces.

This snake, though not poisonous, is sometimes bold enough to attack a man, but may be driven off by a smart stroke from a stick, or whatever other weapon he may chance to have in his hand. When it overtakes a person who has endeavored to escape, (not having had courage enough to oppose it,) it is said to wind itself round his legs in such a manner as to throw him down, and then to bite him several times in the leg, or wherever it can lay hold of, and run off again. In the spring of 1748, Dr. Colden had several workmen at his country seat, and among them one just arrived from Europe, who, of course, knew but little of the qualities of the black snake. The other workmen, who observed a male and female lying together, out of sport engaged their new companion to kill one of them. He accordingly approached them with a stick in his hand: this the male observed, and made towards him. The man little expected to find such courage in the reptile, and, flinging away his stick, ran off as fast as he was able. The snake pursued, overtook him, and, twisting several times round his legs, threw him down, and almost frightened the poor fellow out of his senses. He could not rid himself of the animal without cutting it through in two or three places with a knife.

The black snake (which is altogether harmless, except in the spring) is very greedy of milk, and it is difficult to keep it out when once it is accustomed to get into a cellar where milk is kept. It has been seen taking milk out of the same dish with children without biting them, though they often gave it blows with their spoons upon the head when it was too greedy; of which the reader will find our artist has given a very lively representation.

These snakes are, however, found extremely useful in America in clearing houses of rats, which they pursue with wonderful agility, even to the very roofs of barns and out-houses; for which good services they are cherished by the generality of the Americans, who are at great pains to preserve and multiply the breed. They are also said to destroy the rattle-snakes by twisting round their bodies, and suffocating them by the violence of their contractile force. They are so swift that there is no escaping their pursuit, but their bites have no bad effect. They are only pernicious in skimming the milk-pans of the cream, and robbing the hen-roosts of their eggs. They are very often found coiled up in nests under sitting hens.

BLACK SNAKE.

Pub. May 1, 1806. by James Cundee, London.

## *THE VIPER.*

THE common viper seldom grows to a greater length than two feet, though sometimes they are found above three. The ground color of their bellies is of a dirty yellow; that of the female is deeper. The back is marked the whole length with a series of rhomboid black spots, touching each other at the points; the sides with triangular ones, the belly entirely black. It is chiefly distinguished from the common ringed snake by the color, which in the latter is more beautifully mottled, as well as by the head, which is thicker than the body; but particularly by the tail, which, in the viper, though it end in a point, does not run tapering to so great a length as in the other: when, therefore, other distinctions fail, the difference of the tail can be discerned at a single glance. These animals are found in many parts of our own island, particularly in the dry, stony, and chalky countries. They are also much dispersed over the Old Continent.

Vipers differ from most other serpents in being much slower in their pace, and in bringing forth their young alive, which they produce towards the close of summer. Their fertility, as well as their speed, is happily for mankind diminished, the eggs which are hatched in the womb being usually ten or twelve only in number, and chained together somewhat like a string of beads. When the young have burst the shell, they are said to creep, by their own efforts, from their confinement into the open air, where they continue for several days without taking any food. The Rev. Mr. White, of Selborne, in company with a friend, surprised a large female viper which seemed very heavy and bloated, as she lay on the grass basking in the sun; they killed and cut her up, and found in the abdomen fifteen young ones, about the size of full grown earth-worms. This little fry issued into the world with the true viper spirit about them, showing great alertness as soon as they obtained their liberty. They twisted and riggled about, set themselves up, and gaped very wide when touched with a stick, exhibiting manifest tokens of menace and defiance, though as yet no fangs were to be discovered even with the help of glasses.

The young, for some time after their birth, retreat, when suddenly alarmed, into the mouth of the female, in the same manner as the young of the opossum do into the abdominal pouch of their parent. They arrive at their full growth in about seven years, and produce at the end of their second or third. Their food consists of reptiles, worms, or young birds, which they swallow whole, though it sometimes happens that the morsel is thrice the thickness of their own body. They are capable of supporting long abstinence, one of them having been kept above six months in a box without food, during which time its vivacity was not lessened. When at liberty they remain torpid throughout the winter, yet, when confined, they have never been observed to take their annual repose.

Vipers are usually caught with wooden tongs by the end of the tail. This is done without danger, for, while they are held in that position, they cannot wind themselves up to injure their enemy.

The apparatus of poison in the viper is very similar to that of all the other poisonous serpents. The symptoms that follow the bite are an acute pain in the wounded part, with a swelling, at first red, but afterwards livid, which, by degrees, spreads to the adjoining parts, with a great faintness, and a quick, though low, and sometimes interrupted pulse; great sickness at the stomach, with bilious, convulsive vomitings, cold sweats, and sometimes pain about the navel. The bite of the viper in this country, although it produces a painful and troublesome swelling, is rarely attended with any other bad consequence.

We are told by Dr. Mead, that the poison, when diluted with a little warm water, and applied to the tip of the tongue, is very sharp and fiery, a sensation taking place as if the tongue had been struck through with something scalding or burning. This, he says, goes off in two or three hours. One person, (mentioned by the doctor) tried a large drop of it undiluted, in consequence of which his tongue swelled, with a little inflammation, and the soreness lasted two days. Other persons, on the contrary, assert that it has no particular acrimony of taste, but that, in this respect, it rather resembles oil or gum. Contradictions nearly equal have taken place relative to the effect of viperine poison taken into the stomach. Boerhaave affirms it to produce no ill effect whatever; and the Abbé Fontana, although he asserts that it is devoid of any thing unpleasant to the taste, declares it cannot be swallowed with impunity. We are told, however, that in the presence of the Grand Duke of Tuscany, while the philosophers were making elaborate dissertations on the danger of the poison taken inwardly, a viper-catcher, who happened to be present, requested that a quantity of it might be put into a vessel, and then, with the utmost confidence, and, to the astonishment of the whole company, he drank it off in their presence. Every one expected the man instantly to drop down dead; but they soon perceived their mistake, and found that, taken inwardly, the poison was as harmless as water.

The poison of the viper was anciently collected by many of the European nations as a poison for their arrows, in like manner as that of other serpents is used, at the present day, by the inhabitants of savage nations.

The viper is the only malicious serpent in Great Britain of which we need be afraid. By the application of olive oil, however, its bite is effectually cured. William Oliver, a viper-catcher at Bath, was the first who discovered this admirable remedy. On the 1st of June, 1735, in the presence of a great number of persons, he suffered himself to be bit by an old black viper, brought by one of the company, upon the wrist and joint of the thumb of the right hand, so that drops of blood came out of the wounds: he immediately felt a violent pain, both at the top of his thumb and up his arm, even before the viper was loosened from his hand; soon after he felt a pain, resembling that of burning, trickle up his arm; in a few minutes his eyes began to look red and fiery, and to water much: in less than an hour he perceived the venom seize his heart, with a pricking pain, which was attended with faintness, shortness of breath, and cold sweats; in a few minutes after this his belly began to swell, with great gripings and pains in the back, which were attended with vomitings and purging. During the violence of these symptoms his sight was gone for several minutes, but he could hear all the while. He said that in his former experiments he had never deferred making use of his remedy longer than he perceived the effects of the venom reached his heart; but this time, being willing to satisfy the company thoroughly, and trusting to the speedy effects of his remedy, which was nothing more than olive oil, he forebore to apply any thing till he found himself exceedingly ill and quite giddy. In about an hour and a quarter after the first of his being bit, a chaffing dish of glowing charcoal was brought in, and his naked arm was held over it as near as he could bear, while his wife rubbed in the oil with her hand, turning his arm continually round, as if she would have roasted it over the coals; he said the poison soon abated, but the swelling did not diminish much. Most violent purgings and vomitings soon ensued; and his pulse became so low, and so often interrupted, that it was thought proper to order him a repetition of cordial potions. He said he was not sensible of any great relief from these; but that a glass or two of olive oil, drank down, seemed to give him ease. Continuing in this dangerous condition, he was put to bed, where his arm was again bathed over a pan of charcoal, and rubbed with olive oil heated in a ladle over the charcoal by Dr. Mortimer's directions. From this last operation he declared that he found immediate ease, as though by some charm; he soon after fell into a profound sleep, and, after about nine hours sound rest awaked about six the next morning, and found himself very well; but, in the afternoon, on drinking some rum and strong beer, so as to be almost intoxicated, the swelling returned with much pain and cold sweats, which abated soon on bathing the arm as before, and wrapping it up in a brown paper soaked in the oil.

Notwithstanding the bite of the viper is attended with such dreadful effects, its flesh was formerly esteemed for its medicinal virtues; a broth made by boiling a viper in water, which just covered it, until it came to half the quantity, has been found a powerful restorative in battered constitutions. The salt of vipers was also thought to exceed any other animal salt whatever, in giving vigor to a languid constitution. Modern practitioners, however, very rarely prescribe it.

## *THE RATTLE SNAKE.*

THE color of the rattle snake, which is bred both in North and South America, but in no part of the old world, is yellowish-brown above, marked with broad transverse bars of black. Both the jaws are furnished with small sharp teeth, and the upper one has four large incurvated and pointed fangs. At the base of each is a round orifice, opening into a hollow that appears again near the end of the tooth in the form of a small channel: these teeth may be raised or compressed. When the animals are in the act of biting, they force out of a gland near the roots of the teeth the fatal juice. This is received into the round orifice of the teeth, conveyed through the tube into the channel, and from thence with unerring direction into the wound. The tail is furnished with a rattle, consisting of joints loosely connected: the number of these is uncertain, depending in some measure on the age of the animal, being supposed to increase annually by an additional joint. The young snakes, or those of a year or two old, have no rattle at all.

As the tail of those snakes, which are the most dreaded of all serpents, keep rattling upon the slightest motion, passengers are thus providentially warned of their approach. In fine weather the notice is always given, but not always in rainy weather: this inspires the Indians with a dread of travelling among the woods in wet seasons. In addition to this circumstance, the odour of the rattle snake is so extremely fetid, that when it basks in the sun, or is irritated, it is often discovered by the scent before it is either seen or heard. Horses and cattle frequently discover it by the scent, and escape at a distance; but when the serpent happens to be to leeward of their course, they sometimes encounter its venom.

The tongue of the rattle snake, like that of many other serpents, is composed of two long and round bodies joined together from the root to about half its length. This is frequently darted out and retracted with great agility. There is, besides the fangs with which it kills its prey, another kind of teeth much smaller, and situated in both jaws, which serve for catching and retaining it. There are no grinders, for this animal does not chew its food, but always swallows it whole.

The rattle-snake usually moves with its head on the ground; but, if alarmed, throws its body into a circle, coiling itself with its head in the centre erect, and with its eyes flaming in a most terrific manner. Happily it may be easily avoided; it is slow in pursuit, and has not the power of springing at its assailants. However, it very often enters houses; but the moment any of the domestic animals see or hear it they take alarm, and unite in giving notice of its presence. Hogs, dogs, and poultry, all exhibit the utmost consternation and terror, erecting their bristles and feathers, and expressing by their different notes of alarm that a dangerous enemy is near. Mr. Catesby says that, in a gentleman's house of Carolina, as the servant was making the bed on the ground floor that he had himself left but a few minutes before, he discovered a rattle-snake lying coiled between the sheets in the middle of the bed.

Rattle snakes are viviparous, producing their young, generally about twelve in number, in the month of June, and by September these acquire the length of twelve inches. It has been well attested that they adopt the same mode of preserving their young from danger as that attributed to the common viper, receiving them into their mouth and swallowing them. M. de Beauvois declares that he was an eye-witness to the process. He saw a large rattle snake, which he had disturbed in its walks; it immediately coiled itself up, opened its jaws, and in an instant five small ones that were lying by it rushed into its mouth. He retired in order to watch the snake, and in a quarter of an hour saw her again discharge them. He then approached a second time, when the young rushed into its mouth more quickly than before, and the animal immediately moved off and escaped.

As this creature is known to devour several of the smaller animals, it has been generally believed that it is endued with the power of fascinating or charming its prey till they even run into its jaws. Mr. Pennant (from Kalm) says that the snake will frequently lie at the bottom of a tree on which a squirrel is seated. He fixes his eyes upon the little animal, and from that moment it cannot escape; it begins a doleful outcry, which is so well known, that a person passing by, on hearing it, immediately knows that a snake is present. The squirrel runs up the tree a little way, comes downwards again, then goes up, and afterwards still lower. The snake continues at the bottom of the tree with his eyes fixed on the squirrel, with which his attention is so entirely taken up, that a person accidentally approaching may make a considerable noise without so much as the snake's turning about. The squirrel comes lower, and at last leaps down to the snake, whose mouth is already

RATTLE SNAKE.

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wide open for its reception. The poor little animal then, with a piteous cry, runs into his jaws, and is swallowed. See the annexed engraving.

As a corrobation of this strange fascination, M. Le Vaillant says that he saw, on the branch of a tree, a bird trembling as if in convulsions, and at the distance of about four feet, on another branch, a large species of snake that was lying with out-stretched neck, and fiery eyes, gazing steadily at the poor animal. The agony of the bird was so great that it was deprived of the power of moving away; and when one of the party killed the snake, it was found dead upon the spot, and that entirely from fear, for on examination it appeared not to have received the slightest wound. He further adds, that a short time afterwards he observed a small mouse, in similar agonizing convulsions, about two yards distant from a snake, whose eyes were intently fixed on it; and on frightening away the reptile, and taking up the mouse, it expired in his hand. This gentleman was assured by all the Hottentots who were with him that this was very common; and the fact was also confirmed by the assertions of all to whom he mentioned these instances. This fascinating property, however, has been contradicted by Dr. Barton of Philadelphia, but this gentleman has advanced no powerful reasons for disbelieving the above stories.

The rattle-snakes are in summer generally found in pairs: in winter they collect in multitudes, and retire into the ground, beyond the reach of the frost. Tempted by the warmth of a spring day, they are often observed to creep out in a weak and languid state. Mr. Pennant mentions that a person has seen a piece of ground covered with them, and that he killed with a rod between sixty and seventy, till, overpowered with the stench, he was obliged to retire.

The poison of the rattle snake when irritated, or the weather is exceedingly hot, often proves fatal in a very short time. When angry, this creature's rattle is said to be loud and distinct, but when pleased, to sound like a distinct trepidation, in which nothing distinct can be heard. Negroes, and others who have been bitten by them, have frequently recovered without any assistance, yet the fatality of its poison has been proved by many experiments. We read in the Phil. Trans. that a snake was tied down to a grass plot, and made to bite a healthy cur dog; immediately afterwards the poor animal's eyes were fixed, his teeth closed upon his tongue, which was hanging out, his lips were drawn up so as to leave his teeth and gums bare, and in a quarter of a minute he died. The hair was then taken off by means of hot water, and only one small puncture appeared between his fore legs, with a bluish-green color round it. A second dog was brought about half an hour afterwards, and the snake bit his ear; he exhibited signs of violent sickness, staggered about for some time, then fell down convulsed, and two or three times got up again: he lived near two hours. Four days after this two dogs, as large as common bull-dogs, were bitten by him: the one in the inside of his left thigh, which died exactly in half a minute; and the other on the outside of the thigh, which died in four minutes. Captain Hall, in South Carolina, who made these experiments, wished at last to try whether its poison would prove mortal to itself. He therefore hung it up in such a manner that it had about half its length on the ground, and irritated it by two needles fastened to the end of a stick. The creature made several attempts to seize the stick, and then bit itself. It was let down, and in eight or ten minutes was found to be lifeless. The snake was afterwards cut into five pieces, which were successively devoured by a hog, but without receiving any injury in consequence.

Dr. Brickell says he was a witness to an encounter between a dog and a rattle snake, which was fastened to the ground by a tolerably long string. The snake coiled up, and rattled its tail; and the dog being let loose seized, and attempted to shake it out at full length, but from the weight was preserved from doing it, and in consequence it bit him in the ear. He seemed somewhat stunned, and left the place, but returned on being encouraged by the company. In the second encounter he received a bite in his lip, after which the snake bit himself. The dog from that moment appeared senseless of every thing around him, even the caresses of his brutal master had now no effect, and in less than half an hour both the animals were found dead.

A rattle-snake, which had been highly irritated by an Indian dog, that had both cunning and agility enough always to keep out of his reach, was observed at the time to contract the muscles that moved his scales, in such a manner as to make his body appear extremely bright; but immediately after he had bitten himself all his splendor was gone.

An American writer of respectability asserts, that a farmer was one day mowing with his negroes, when he by chance trod on a rattle snake, that immediately turned upon him, and bit his boot. At night, when he went to bed, he was attacked with a sickness; he swelled, and before a physician could be called in, he died. All his neighbours were surprised at this sudden death, but the corps was interred without examination. A few days after one of the sons put on his father's boots, and at night when he pulled them off he was seized with the same symptoms, and died on the following morning. The doctor arrived, but, unable to divine the cause of so singular a disorder, seriously pronounced both the father and the son to have been bewitched. At the sale of effects a neighbour purchased the boots, and on putting them on experienced the like dreadful symptoms with the father and son;

a skilful physician, however, being sent for, who had heard of the preceding affair, suspected the cause, and, by applying proper remedies, recovered his patient. The fatal boots were now carefully examined, and the two fangs of the snake were discovered to have been left in the leather with the poison-bladders adhering to them. They had penetrated entirely through, and both the father and son had imperceptibly scratched themselves with their points in pulling off the boots.

Dr. Goldsmith also relates, that, as a gentleman in Virginia was walking in the fields for his amusement, he accidentally trod upon a rattlesnake that had been lurking in a stony place, which, enraged by the pressure, reared up, bit his hand, and shook its rattles. The gentleman readily perceived that he was in the most dreadful danger; but, unwilling to die unrevenged, he killed the snake, and carrying it home in his hand, threw it on the ground before his family, crying out, " I am killed, and there is my murderer!" In such an extremity, the speediest remedies were the best. His arm, which was beginning to swell, was tied up near the shoulder, the wound was anointed with oil, and every precaution taken to stop the infection. By the help of a very strong constitution he recovered, but not without feeling the most various and dreadful symptoms for several weeks together. His arm, below the ligature, appeared of several colors, with a writhing among the muscles, that, to his terrified imagination, appeared like the motions of the animal that had wounded him. A fever ensued; the loss of his hair, giddiness, drought, weakness, and nervous faintings, till, by slow degrees, a very strong habit overpowered the latent malignity of the poison.

These animals, if not provoked, are perfectly inoffensive, being so much alarmed at the sight of a man, as always, if possible, to avoid him, and never commencing an attack. Mr. St. John once saw a tamed rattle snake, as gentle as it is possible to conceive a reptile to be. It went to the water and swam whenever it pleased, and when those to whom it belonged called it back, their summons was immediately obeyed. It had been deprived of its fangs, and its keeper often stroked it with a soft brush, which friction seemed to cause the most pleasing sensation, for it would thereupon turn on its back to enjoy it as a cat does before the fire.

The American Indians often regale on the rattle snake, which, when they find asleep, they put a small forked stick over its neck, which they keep immovably fixed to the ground, giving the animal a piece of leather to bite, and this they pull back with great force till they observe that the poisonous fangs are torn out. They then cut off the head, skin the body, and cook it as we do eels. The flesh is said to be exceedingly white and nutritious.

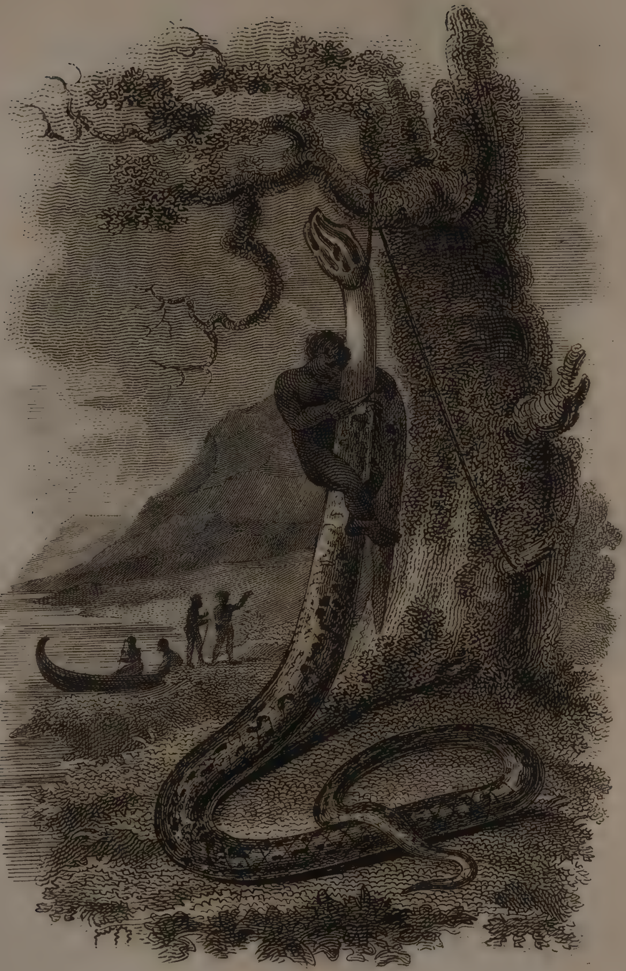
## THE BOA.

THE ground color of the body of this animal, which is the largest and strongest of the serpent race, is yellowish-grey, on which is distributed, along the back, a series of large chain-like, reddish brown, and sometimes perfectly red variegations, with other smaller and more irregular marks and spots. They are readily distinguished from other serpents in the under surface of the tail being covered with scuta or undivided plates like those on their belly, and in their body not being terminated by a rattle. There are three species, natives of Africa, India, the larger Indian islands, and South America, where they chiefly reside in most retired situations in woods and marshy retreats.

The great boa is frequently from thirty to forty feet in length, and of a proportionate thickness. As a proof of the enormous size of these animals, it is recorded by a gentleman, who had some large concerns in America, that he one day sent out a soldier with an Indian to kill some wild fowl, and in pursuing their game the Indian, who generally went before, beginning to tire, sat down upon what he supposed to be the fallen trunk of a tree; but the monster beginning to move, the poor fellow perceived what it was that he had thus approached, and dropped down in an agony. The soldier, who, at some distance, saw what had happened, levelled his piece at the serpent's head, and, by a lucky aim, shot it dead; and, going up to the relief of his companion, found that he was also dead from his fright. On his return he related what had happened; the animal was ordered to be brought, and it was found to be thirty-six feet long. The skin was stuffed, and sent to the cabinet of the Prince of Orange.

We also read in the Bombay Courier of August 31, 1799, that a Malay prow was making for the port of Amboyna, but the pilot, finding she could not enter it before dark, brought her to anchor for the night close under the island of Celebes. One of the crew went on shore in quest of betel nut in the woods, and on his return lay down, as it is supposed, to sleep on the beach. In the course of the night he was heard by his comrades to scream out for assistance. They immediately went on shore, but it was too late, for an immense snake of this species had crushed him to death. The attention of the monster being entirely occupied by his prey, the people went boldly up to it, cut off its head, and took both it and the body of the man on board their boat. The snake had seized the poor fellow by the right wrist, where the marks of the fangs were very distinct; and the mangled corpse bore evident signs of being crushed by the monster's twisting itself round the head, neck, breast, and thigh. The length of the snake was about thirty feet; its thickness equal to that of a moderate-sized man; and, on extending its jaws, they were found wide enough to admit at once a body of the size of a man's head.

Captain Stedman, when on board one of his boats on the river Cottica in Surinam, was informed by one of his slaves that a large snake was lying among the brush wood on the beach, not far distant; and after some persuasion he was induced to land, in order to shoot it. On the first shot the ball, missing the head, went through the body, when the animal struck round, and with such astonishing force, as to cut away all the underwood around him with the facility of a scythe mowing grass; and by flouncing his tail caused the mud and dirt in which he lay to fly over the men's heads that were with him to a considerable distance. They started back some way, but the snake was quiet again in a few minutes. Captain Stedman again fired, but with no better success than before; and the animal sent up such a cloud of dust and dirt as he had never seen but in a whirlwind, which caused them once more suddenly to retreat. After some persuasions he was induced, though much against his inclination, being exceedingly weak from illness, to make a third attempt. Having, therefore, once more discovered the snake, they discharged their pieces at once, and shot him through the head. The negro brought a boat-rope to drag him to the canoe which was lying on the bank of the river. This proved no easy undertaking, since the huge creature, notwithstanding his being mortally wounded, still continued to writhe and twist about in such a manner as to render it dangerous for any person to approach him. The negro made a running noose on the rope, and, after some fruitless attempts to make an approach, threw it over his head with much dexterity; and now, all taking hold of the rope, they dragged him to the beach, and tied him to the stern of the canoe to take him in tow. Being, however, still alive, he there kept swimming like an eel. The length of this animal, which the negroes declared to be only a young one, and but arrived at half its growth, was upwards of twenty-two feet; and its thickness about that of a boy near twelve years old, as was proved by measuring the creature's skin round the body of the boy that was with them. When they came to one of their stations they hauled him on shore to skin him and take out the oil. To effect this purpose, one of the negroes having climbed up a tree with the end of a rope, let it down over a strong forked branch, and the others hoisted up the snake and suspended him from the tree. This done, the former negro, with a sharp knife between his teeth, left the branch,



SKINNING THE GREAT BOA.

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and clung fast upon the monster, which was still writhing, and began his operations by ripping it up, and stripping down the skin as he descended. "Though I perceived (adds Captain Stedman) that the animal was no longer able to do him any injury, I confess I could not, without emotion, see a man stark naked, black and bloody, clinging with his arms and legs round the slimy and yet living monster." This labor, however, was not without its use; since he not only dexterously finished the operation, but saved from the animal above four gallons of fine clarified fat, or rather oil, which proved of much use to the surgeons at the hospital: as much again as this was also supposed to have been wasted. The negroes cut the animal in pieces, and would have eaten it, had they not been refused the use of the kettle to boil it in. The reader will find hereto annexed an engraved representation of the negro's operation.

One of these animals has been known, in the island of Java, to kill and devour a buffalo. In a letter printed in the German Ephemerides, there is an account of a combat between an enormous serpent and a buffalo, by a person who assures us that he was himself a spectator. The serpent had for some time been waiting near the brink of a pool in expectation of its prey, when a buffalo was the first animal that appeared. Having darted upon the affrighted beast, it instantly began to wrap him round with its voluminous twistings; and at every twist the bones of the buffalo were heard to crack almost as loud as the report of a gun. It was in vain that the animal struggled and bellowed; its enormous enemy entwined it so closely that at length all its bones were crushed to pieces like those of a malefactor on the wheel, and the whole body reduced to one uniform mass; the serpent then untwined its folds, to swallow its prey at leisure. To prepare for this, and also to make it slip down the throat the more smoothly, it was seen to lick the whole body over, and thus cover it with a mucilaginous substance. It then began to swallow it at the end that afforded the least resistance; and in the act the throat suffered so great a dilation, that it took in at once a substance that was thrice its own thickness.

Travellers have also asserted that these animals are sometimes found with the body of a stag in their gullet; while the horns, which they are unable to swallow, are seen sticking out at their mouths. Happily for mankind the rapacity of these creatures is often their own punishment; for, whenever they have gorged themselves in this manner they become torpid, and may be approached and destroyed with safety. Patient of hunger to a surprising degree, whenever they seize and swallow their prey they seem, like surfeited gluttons, unwieldy, stupid, helpless, and sleepy. They at that time seek for some retreat, where they may lurk for several days together, and digest their meal in safety. The smallest effort then will destroy them; they scarcely can make any resistance; and, equally unqualified for flight or opposition, even the naked Indians do not fear to assail them. But it is otherwise when this sleeping interval of digestion is over; they then issue, with famished appetites, from their retreats, and with accumulated terrors, while every animal of the forest flies from their presence. They never bite, however, from any other impulse than that of hunger, and when they do their bites are destitute of venom.

## *THE BLINDWORM, DOUBLE-HEADED SERPENT, &c.*

THE blindworm, though it has a formidable appearance, is a harmless reptile. The eyes are red, the head small, the neck still more slender; from that part the body increases suddenly, and continues of an equal bulk to the tail, which ends quite blunt. The color of the back is cinereous, marked with very small lines, composed of minute black specks. The motion of this serpent is slow, from which, and from the smallness of the eyes, are derived its name; some calling it the slow, and some the blindworm. Its general length is eleven inches. Like all the rest of the kind in our climates, they lie torpid during winter, and are sometimes found in vast numbers twisted together. This animal, like the former, is perfectly innocent; but, like the viper, it brings forth its young alive.

The amphisbæna, or double-headed serpent, is remarkable for moving along with either the head or the tail foremost, whence it has been thought to have two heads, an error which the slightest inspection detects. It is of equal thickness at both ends; the color of the skin is like that of the earth; it is rough, hard, and spotted. Some have affirmed that its bite is dangerous, but this must be a mistake, as it wants the fangs, and consequently the elaboratory that prepares the poison.

There are several other kinds of snakes which in some degree are similar to the above-mentioned. The Esculapian serpent of Italy is so harmless, that in that country it is suffered to crawl about the chambers, and often gets into the beds where people lie. It is a yellow serpent, of about an ell long, and, though innocent, yet will bite when exasperated. The boyuna of Ceylon is equally a favorite in that place. The Surinam serpent is also harmless and desirable among the natives, who consider themselves extremely happy if this animal come into their huts. The colors of this serpent are so many and beautiful, that they surpass all description; and these, perhaps, are the chief inducements to the savages to consider its visits as so very fortunate.

A still greater favorite is the prince of serpents, a native of Japan, that has not its equal for beauty. The scales which cover the back are reddish, fine shaded, and marbled with large spots of irregular figures mixed throughout with black. The gerenda of the East Indies and the African gerenda are highly honored and esteemed.

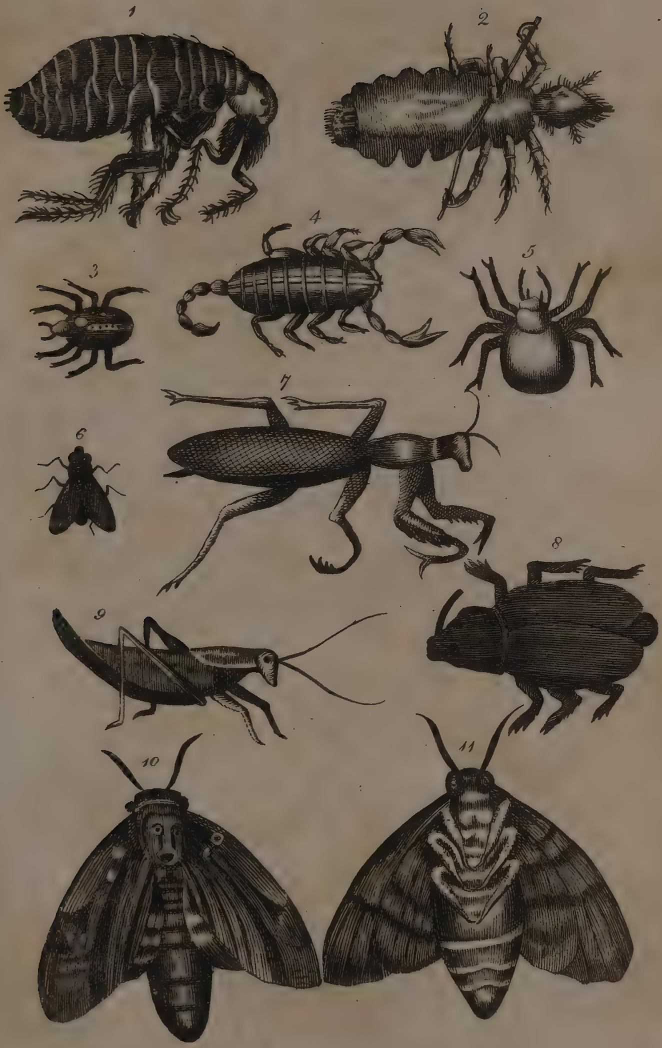
## CHAP. IV.

"Observe the insect race—ordain'd to keep
The lazy sabbath of a half year's sleep!
Entomb'd beneath the filmy web they lie,
And wait the influence of a kinder sky;
When vernal sunbeams pierce their dark retreat,
The heaving tomb distends with vital heat,
The full-form'd brood impatient of their cell,
Start from their trance and burst their silken shell."

MRS. BARBAULD.

## OF INSECTS IN GENERAL.

THIS class of animals is by some naturalists considered as the most imperfect of any, while others prefer them to the larger animals. One mark of their imperfection is said to be, that many of them can live a long time, though deprived of those organs which are necessary to life in the higher ranks of nature. Many of them are furnished with lungs and an heart like the nobler animals; yet the caterpillar continues to live, though its heart and lungs, which is often the case, are entirely eaten away. It is not,



INSECTS.

Pub. May 1 1805, by James Cundee, London.

however, from their conformation alone, that insects are inferior to other animals, but from their instincts also. It is true that the ant and the bee present us with striking instances of assiduity; yet even these are inferior to the marks of sagacity displayed by the larger animals. A bee taken from the swarm is totally helpless and inactive, incapable of giving the smallest variations to its instincts. It has but one single method of operating, and if put from that it can turn to no other: in the pursuits of the hound there is something like choice, but in the labors of the bee the whole appears like necessity and compulsion. All other animals are capable of some degree of education; their instinct may be suppressed or altered; the dog may be taught to fetch and carry, the bird to whistle a tune, and the serpent to dance; but the insect has only one invariable method of operating; no art can turn it from its instincts; and, indeed, its life is too short for instruction, as a single season often terminates its existence. Their amazing number is also an imperfection. It is a rule that obtains through all nature, that the nobler animals are slowly produced, and that Nature acts with them in a kind of dignified economy; but the meaner births are lavished in profusion, and thousands are produced merely to supply the necessities of the more favorite part of the creation. Of all productions in nature, insects are by far the most numerous. The vegetables which cover the face of the earth bear no proportion to the multitude of insects; and though, at first sight, herbs of the field seem to be the parts of organized Nature produced in the greatest abundance, yet, upon more minute inspection, we find every plant supporting a multitude of scarcely perceptible creatures, that fill up the compass of youth, vigor, and age, in the space of a few days existence. In Lapland and some parts of America, the insects are so numerous, that if a candle be lighted they swarm about it in such multitudes, that it is instantly extinguished by them; and in those parts of the world, the miserable inhabitants are forced to smear their bodies and faces with tar, or some other unctuous composition, to protect them from the stings of their minute enemies.

Others, particularly Swammerdam, who argue for the perfection of insects, say, that after an attentive examination of the nature and anatomy of the smallest as well as the largest animals, an equal, or perhaps a superior degree of dignity must be allowed to even the least. If, while we dissect with care the larger animals, we are filled with wonder at the elegant disposition of their parts, to what a height is our astonishment raised when we discover all these parts arranged in the least in the same regular manner? Notwithstanding the smallness of ants, nothing hinders our preferring them to the largest animals, if we consider either their unwearied diligence, their strength, or their inimitable propensity to labor. Their amazing love to their young is still more unparalleled among the larger classes; they not only daily carry them to such places as may afford them food, but if by accident they are killed, and even cut into pieces, they will, with the utmost tenderness, carry them away piecemeal in their arms. Who can shew such an example among the larger animals, who are dignified with the title of perfect? Who can find an instance in any other creature that can come in competition with this?

Insects have received their name from the individuals of which this division of the animal world is composed having a separation in the middle of their bodies, by which they are cut into two parts. These parts are in general connected by a slender ligament or hollow thread. These creatures breathe through pores arranged along their sides, and have a head or bony skin, and many feet. The greater part of them are furnished with wings. They are destitute of brain, nostrils, ears, and eyelids. Not only the liver, but all the secretory glands, are in them replaced by long vessels that float in the abdomen. The mouth is in general situated under the head, and is furnished with transverse jaws, with lips, a kind of teeth, a tongue, and palate; it has also, in most instances, four or six palpi, or feelers. Insects have also movable antennæ, proceeding generally from the front part of the head, which are endowed with a very nice sense of feeling.

Cuvier, who, in all his examinations, could find neither a heart nor arteries in insects, says, that their whole organization is such as we would expect to find if they had been actually known not to be provided with such organs. Their nutrition, therefore, would seem to be carried on by immediate absorption, as is evidently the case with the polypes, and other zoophytes, which are considerably below insects in the perfection of their organization.

Nearly all insects (except spiders, and a few others of the apterous tribe, which proceed nearly in a perfect state from the egg) undergo a metamorphosis at three different periods of their existence. They are generally so short lived, that the parents have but seldom an opportunity of seeing their living offspring. Consequently, they are neither provided with milk, like viviparous animals, nor are they, like birds, impelled to sit upon their eggs in order to bring their young to perfection. In place of these, the all-directing Power has endued each species with the astonishing faculty of being able to discover what substance is best to afford the most proper food for its young; though such food is for the most part so totally different from that which the parent itself could eat, as that, in many cases, it would prove a deadly poison to it. Some of them attach their eggs to the bark, or insert them into the leaves of trees and other vegetable substances; others form nests, which they store with insects or caterpillars that will attain the exact state in which they are proper food for their young when they shall awaken into life; others bury them in the bodies of other insects; and others fall upon astonishing contrivances to convey their eggs into the body, or the internal viscera of larger animals. Some drop their eggs into the water, in which they themselves would soon be destroyed, as if they foresaw that their progeny, in its first state of existence, could only subsist in that element. In short, the variety of contrivances that are adopted by insects to insure the subsistence of their young when they shall come into life are beyond enumeration. It may, however, with great truth be said, that all the means they adopt are so perfectly adapted to answer the purpose intended, as to discover a degree of knowledge that leaves the boasted wisdom of man at an infinite distance behind.

The insect, as soon as it comes out of the egg, was by former entomologists called eruca; but as this is synonimous with the botanic name sisymbrium, it was changed by Linnæus for the term larva, a name expressive of the insect's being, in this state, as it were masked, having its true appearance concealed. Under this mask, or skin, the entire insect, such as it afterwards appears when perfect, lies concealed, enveloped only in its tender wings, and putting on a soft and pulpy appearance; insomuch that Swammerdam was able to demonstrate a butterfly, with its wings, to exist in a caterpillar, though it bore but a faint resemblance to its future perfection. The insect, therefore, in this state, undergoes no other alteration but the change of its skin; the larvæ are, for the most part, larger than the insects when perfect, and are very voracious; the caterpillar of the cabbage butterfly eats double what it would seem to require from its size; but its growth is not adequate to its voracity.

Pupa, the insect in this state, was formerly called chrysalis, or aurelia, but as the appearance of gilding is confined to a few butterflies only, the term of pupa has been adopted in its stead; because the lepidoptena especially, resembles an infant in swaddling clothes; and in this state all, except those of the hemiptera class, take no nourishment.

Tonago is the third state: this name is given by Linnæus to this third change, in which the insect appears in its proper shape and colors; and as it undergoes no more transformations, it is called perfect. In this state it flies, is capable of propagating its species, and receives true antennæ which before, in most insects, were scarce perceptible.

The head of insects is without brain; and on the fore-part are in general placed two antennæ, or horns, which are peculiar to insects, and are plainly distinguishable from the palpi, which are more numerous, commonly four, sometimes six; they are placed near the mouth, and are sometimes wanting. Some have imagined that the antennæ were their organs of hearing; for it is evident, from various experiments, that insects are possessed of this sense in a degree as exquisite as most other animals, although, from their minuteness, we perhaps may never discover by what means.

Mr. Barbut supposes insects to possess the sense of hearing in a very distinct manner. "Many insects," he observes, "are well known to be endowed with the power of uttering sounds, such as large beetles, the bee, wasp, common fly, gnat, &c. the sphinx atropos squeaks when hurt nearly as loud as a mouse. Now, if insects are endowed with the power of uttering sounds, it certainly must be for some purpose. As they vary their cry occasionally, it must certainly be designed either to give notice of pleasure or pain, or some affection in the creature who possesses it. The knowledge of their sounds," says that author, "is undoubtedly confined to their tribe, and is a language intelligible to them only, saving when violence obliges the animal to exert the voice of nature in distress, craving compassion; then all animals understand the doleful cry. For instance, attack a bee or wasp near the hive or nest, or a few of them, the consequence of that assault will be, the animal, or animals, by a different tone of voice, will express his or their disapprobation or pain. That sound is known to the hive to be plaintive, and that their brother, or brethren, require their asssistance; and the offending party seldom escapes with impunity. Now, if they had not the sense of hearing, they could not have known the danger their brother, or brethren, were in by the alteration of their tone."

Another proof, (which he reckons still more decisive,) was taken from an observation made by himself on a large spider in St. James's Park. This creature had made a very large web on a wooden railing, and was, at the time of observation, on one of the rails at a considerable distance from the place where a large fly entangled itself. Nevertheless, the moment the fly was entangled, the spider became sensible of it; though, from the situation of the rain, he could not possibly have seen it. In this, however, Mr. Barbut might possibly be deceived; because the spider was, perhaps, alarmed by the tremulous motion of the threads, occasioned by the fluttering of the fly, which he might well know how to distinguish from their vibration by the wind. The organ of hearing, in this gentleman's opinion, is situated in the antennæ, both from their situation in the part of the head most favorable to such organs, and their inward structure being movable, the ears of most inferior animals being so. He has never considered the antennæ as either offensive or defensive, but has observed them to be endowed with an exquisite sense of feeling; that the animal appeared to be in agony when its antennæ were pinched, and that it takes care to avoid the touching any hard substance with them roughly. "This tenderness in the organ of hearing," says he, "is common to all animals; and insects seem to be particularly tender in these parts, by quickly withdrawing them from the touch." That author further observes, that the antennæ of all insects are composed of joints varying in size, form, and number. Those who are chiefly confined to live under water, have their antennæ shorter than those who live on land; some, who roam at large in the air, have them long and slender. They are all hollow, and are rendered flexible by the joints. This hollowness, in our author's opinion, is to receive the sound communicated to the extremities of the antennæ by the repercussion of the air affected by any noise, and convey it, by means of the joints, from one to another, till it arrives in that lessened degree of tone best suited to the timid nature of the animal. In this circumstance there may be many variations in point of perfection in those organs; the strength, utility, and degree of power in receiving sound, being proportioned to the necessities of the animals different in their nature and requisites. In most animals the entrance to the auricular organ is patulous; but in this case the animal would suffer great inconvenience from such an organization, as the organ would often be clogged with dirt, &c.

The antennæ, however, seem little likely to answer the purpose of ears: these instruments of apparently exquisite sensibility must be adapted to very different purposes to which mankind is a stranger.

It has also appeared dubious if they have the sense of smell, no organ being found in them adapted to that purpose; and although it was evident they had a perception of agreeable and fetid effluvia, it was thought to be in a manner altogether unknown to us. Mr. Barbut is of opinion, that the organs of smell reside in the palpi, or feelers. Many insects have four, and some six, two of which are in general chaliform, in order to assist the insect in conveying its food to its mouth. It may be likewise observed, that the palpi are in continual motion, the animal thrusting them into every kind of putrid or other matter, as a hog would do his nose, smelling and searching after food. Insects which apparently do not possess palpi, or spiral tongues. have undoubtedly some organ concealed within the mouth analogous to them in function and utility, the fleshy proboscis of the fly is thrust into every substance in which the animal expects to find food; and when it is extended, nearly in the middle are situated, in our author's opinion, two upright palpi, which, no doubt, perform in their turn some office, perhaps that of smell.

Many insects have no tongue, nor make any sound with their mouth; but, for this purpose, some use their feet, others their wings, and others some elastic instrument with which they are naturally furnished.

Most insects have two eyes, but the gyrinus has four, the scorpion six, the spider eight, and the scolopendra three; they have no eye-brows, but the external tunic of their eyes is hard and transparent like a watch-glass; their eyes have no external motion. They chiefly consist of one lens only; but in those of the butterfly, and many of the bettles, they are more numerous. Pugett discovered 17,325 lenses in the cornea of a butterfly, and Leuwenhoek 800 in a fly.

The mouth of most insects is placed in the anterior part of the head, extending somewhat downward; but in some it is placed under the breast, as in the chermes, &c. Many have a proboscis, which is the mouth drawn out to a rigid point; in several of the hemiptera class it is bent downward towards the breast and belly, as in the bug, &c. They have in general two jaws; some of them, indeed, have four, and others even more; they are placed horizontally; the inner edge of them in some is serrated, or furnished with little teeth. The tongue, as in the butterfly, is taper and spiral, but in others it is fleshy, resembling a proboscis, and tubular, as in the fly.

The major part of insects have the number of their legs confined to six; mites, spiders, and scorpions, however, have eight; the onifcus has fourteen, and there are some few which have still more. The first joint of the leg is generally thickest, and is called femur; the second, which is of the same size throughout, tibia; the third, which is jointed, tarsus; and the last, which in most insects is double, unguis. The claws are the fore feet enlarged towards their extremities, each of which is furnished with two lesser claws, which act like a thumb and finger.

Their wings are membraneous and undivided, except in the instance of the phalænæa alucitæ, in which they are in part divided. Most insects have four, but the diptera class and the coccus have only two. The wing is divided into its inferior and superior surfaces; its anterior part in a butterfly is that towards the anterior margin, or next to the head; its posterior part that towards the anus; its exterior part that towards the outer edge; and the inferior that next the abdomen.

Their tails, with very few exceptions, are simple, capable of being extended and drawn back at pleasure.

In many insects the male and female are with difficulty distinguished; and in some they differ so widely, that an unskilful person might easily take the male and female of the same insect for different species, as in the phalæna, humuli, piniaria, russula, each sex of which differs in color.

As insects possess the various powers of creeping, flying, and swimming, there is scarce any place, however remote and secure, in which they are not to be found; and therefore, upon casting a slight view over the whole insect tribe, just when they are supposed to rouze from their state of annual torpidity, when they begin to feel the genial influence of spring, and again exhibit new life in every part of nature, their numbers and their varieties seem to exceed all powers of calculation, and they are certainly too great for description; but from the similitudes of the form, manners, and propagation of several of them, the extensive description has been easily compressed, and rendered a separate history for each species totally unnecessary. The whole class of insects has by our latest writers been divided into four orders. The first are those which want wings, that appear crawling about on every plant, and on every spot of earth which we regard with any degree of attention: those, therefore, that never have wings, but creep about till they die, may be considered as constituting the first class of insects. All these, the flea and the wood-louse only excepted, are produced from an egg; and, when once they break the shell, they never suffer any further change of form, but continue to grow larger till they die. The second order consists of such as have wings; but which, when produced from the egg, have those wings cased up in such a manner as not to appear. The third order is of the moth and butterfly kind. These all have four wings, each covered with a mealy substance of various colors, which, when handled, comes off upon the fingers; and, if examined by the microscope, will appear like scales, with which the wing is nicely embroidered over. The fourth order is of those winged insects which come from a worm instead of a caterpillar, and yet go through changes similar to those which moths and butterflies are seen to undergo. To these may be added, as a fifth order, a numerous tribe lately discovered, to which the name of zoophytes has been given. These do not go through the ordinary forms of generation, but may be propagated by dissection. They seem a set of creatures placed between animals and vegetables, and make the shade that connects animated and insensible nature.

## CHAP. V.

"The *spider's* touch, how exquisitely fine!
Feels at each thread and lives along the line."
POPE.

"But chief to th' heedless flies the window proves
A constant death; where, gloomily retir'd,
The villain *spider* lives: cunning and fierce,
Mixture abhorr'd! Amid a mangled heap
Of carcases, in eager watch he sits,
O'erlooking all his waving snares around."
THOMSON.

## THE SPIDER.

THERE are several species of this insect, but every kind has two divisions in its body. The fore part, containing the head and breast, is separated from the hinder part, or belly, by a very slender thread, through which, however, there is a communication from one part to the other. The fore part is covered with a hard shell, as well as the legs, which adhere to the breast; the hinder part is clothed with a supple skin, beset all over with hair. They have several eyes all round the head, brilliant and acute; these are sometimes eight in number, sometimes but six; two behind, two before, and the rest on each side. Like all other insects, their eyes are immovable, and they want eye-lids; but this organ is fortified with a transparent horny substance, which at once secures and assists their vision. As the animal procures its subsistence by the most watchful attention, so large a number of eyes was necessary to give it the earliest information of the capture of its prey. They have two pincers on the fore part of the head, rough, with strong points, toothed like a saw, and terminating in claws like those of a cat. A little below the point of the claw there is a small hole, through which the animal emits a poison, which, though harmless to us, is sufficiently capable of instantly destroying its prey. This is the most powerful weapon they have against their enemies; they can open or extend these pincers as occasion may require; and when they are undisturbed, they suffer them to lie one upon the other, never opening them but when there is a necessity for their exertion. They have all eight legs, jointed like those of lobsters, and similar also in another respect; for if a leg be torn away, or a joint cut off, a new one will quickly grow in its place, and the animal will find itself fitted for combat as before. At the end of each leg there are three crooked movable claws; namely, a small one, placed higher up, like a cock's spur, by the assistance of which it adheres to the threads of its web. There are two others larger, which meet together like a lobster's claw, by which they can catch hold of the smallest depressions, walking up or down the very polished surfaces, on which they can find inequalities that are imperceptible to our grosser sight; but when they walk upon such bodies as are perfectly smooth, as looking-glass, or polished marble, they squeeze a little sponge which grows near the extremity of their claws, and thus diffusing a glutinous substance, adhere to the surface until they make a second step. Besides the eight legs just mentioned, these animals have two others, which may more properly be called arms, as they do not serve to assist motion, but are used in holding and managing their prey. See figure 5 in the plate of insects.

The spider, though thus formidably equipped, would seldom prove successful in its captures, were it not equally furnished with other instruments to assist its depredations. It is a most experienced hunter, and spreads its nets to catch such animals as it is unable to pursue. The house spider feeds principally on flies, and the web by which they are enabled to entangle these insects, is generally laid in those places where flies are most apt to come and shelter; and there this little animal remains for days, nay weeks together, in patient expectation, seldom changing its situation though ever so unsuccessful.

For the purpose of forming this web, which is a surprising part of the animal economy, the spider is supplied with a quantity of glutinous matter contained in a receptacle near the extremity of its body, and it has five teats for spinning it into thread, the orifices of which it has also the power of contracting and dilating at pleasure. When it enters on the construction of this curious fabric, the animal first distils one little drop of glutinous liquor, which is very tenacious; and then creeping along the wall, and joining its thread as it proceeds, darts itself to the opposite side, where the other end is to be fastened. The first thread thus formed being drawn tight and fixed at each end, the spider runs on it backwards and forwards, still doubling and strengthening it, as on this depends the stability of the whole. The scaffolding thus completed, it makes a number of threads parallel to the first, and then crosses them with others, the clammy substance of which they are formed serving, when first made, to bind them to each other. At the bottom of the web a kind of funnel is constructed, in which the little creature lies concealed.

This animal's web differs from those woven by any human artist in this circumstance, that, in our work, the threads extended in length are interlaced with those that are carried on transversely; whereas the threads of a spider's woof only cross the threads of the warp, and are glued to them in the points where they mutually touch, and are not either interserted or interwoven. The threads along the border of the work are doubled or trebled, by the spider's opening all her teats at once, and gluing several threads over one another, sensible that the extremity of the web ought to be hemmed and fortified to preserve it from being torn: she likewise further secures and supports it with strong loops, or double threads, which she fixes all around it, and which hinder it from being the sport of the winds. From time to time she finds it necessary to clear away the dust, which would otherwise incommode her web, and she sweeps the whole by giving it a shake with her paw; but in doing this she no nicely proportions the force of the blow to the strength of the work that nothing is ever broken. From all parts of the web are drawn several threads, which terminate like rays in a centre at the place of her concealment. The vibration of any of these threads is communicated to her, and gives her notice whenever there is game in the net, and accordingly she springs upon it in an instant. She derives another advantage from this retreat under her web, and that is, the opportunity it affords of feasting on her prey in full security; and besides this it gives her the power of concealing the carcases, and not leaving in the purlieus any traces of her barbarity capable of intimating the place of her resort, and inspiring other insects with the dread of approaching it.

It often happens that the wind, or the shaking of the supporters, or the approach of some large animal, destroys in a minute the tedious labors of this industrious insect. In this case the spider is obliged to remain a patient spectator of the universal ruin; and when the danger is passed away, it sets about repairing the calamity, being possessed of a large quantity of the glutinous matter, which, when exhausted, nothing can renew. The time seldom fails to come when their reservoirs are entirely dried up, and the poor animal is left to all the chances of irretrievable necessity. An old spider is thus frequently reduced to the greatest extremity; its web is destroyed; and it wants the materials to make a new one; but as it has been long accustomed to a life of shifting, it hunts about to find out the web of another spider, younger and weaker than itself, with whom it ventures a battle. The invader generally succeeds; the young one is driven out to make a new web, and the old one remains in quiet possession. If, however, the spider is unable to dispossess any other of its web, it then endeavors, for a while, to subsist upon accidental depredation; but in two or three months it inevitably dies of hunger.

When two spiders of equal size meet in combat, neither of them will yield; they hold each other by their fangs so fast that one of the two must die before they are separated. M. Leuwenhoek saw one spider that was, however, only wounded in the leg by his antagonist. A drop of blood as large as a grain of sand issued from the sore; and not being able to use this wounded leg in running away from his enemy, he held it up, and presently afterward the whole limb dropped from his body. When spiders are wounded in the breast or upper parts of their body, they always die.

The spider, like many insects of the beetle kind, exhibit an instinct of a very extraordinary nature. When put in terror by a touch of the finger, the animal runs off with great swiftness; but if he find that, whatever direction he takes, he is opposed by another finger, he then seems to despair of being able to escape, contracts his limbs and body, lies perfectly motionless, and counterfeits every symptom of death. In this situation Mr. Smellie has pierced them with pins, and torn them to pieces, without their discovering the smallest marks of pain. Some beetles, when counterfeiting death, will suffer themselves to be gradually roasted without moving a single joint. As soon as the object of terror is removed, the spider runs off with great rapidity, therefore this simulation is mere artifice, and no convulsion or sudden stupor, as has been supposed.

The spider changes its skin at certain seasons, at which time an opening may be seen, if carefully watched, in the belly. Through this it draws all its limbs, and leaves the old covering hanging to the cord that sustained it during the operation.

As spiders often prey upon each other, they have been supposed to be both male and female; but this is contradicted by Lister, who asserts that the males are much less than the females.

The garden spider spins her web in a different manner from the house spider, yet it is not performed with less art. When desirous of flitting from one place to another, she fixes one end of a thread to the place where she stands, and then with her hind paws draws out several other threads from the nipples, which being lengthened out and driven by the wind to some neighboring tree or other object, are by their natural clamminess fixed to it. When she finds that these are fastened, she makes of them a bridge, on which she can pass or repass at pleasure. This done, she renders the thread still thicker by spinning others to it; from this thread she often descends by spinning downward to the ground. The thread formed by the latter operation she fixes to some stone, plant, or other substance. She re-ascends to the first thread, and at a little distance from the second begins a third, which she fixes in the same manner. She now strengthens all the three threads, and, beginning at one of the corners, weaves across, and at last forms a strong and durable net, in the centre of which she places herself with her head downward to wait for her prey.

M. le Vaillant having frequently remarked that spiders spread their webs in solitary and confined places, to which it is sometimes difficult for flies to penetrate, naturally concluded that these creatures must frequently remain long without food, and that consequently they were capable of enduring considerable abstinence. In order to prove this circumstance, he took a large garden spider (whose belly was about the size of a nut) and inclosed it under a glass bell, which he secured with cement round its bottom, and left in this situation for ten months. Notwithstanding this deprivation of food, it appeared during the whole time equally vigorous and alert; but its belly decreased, till at last it was scarcely larger than the head of a pin. He then put under the bell to it another spider of the same species. For a little while they kept at a respectful distance from each other, and remained motionless: but presently the meagre one, pressed by hunger, approached and attacked the stranger. It returned several times to the charge, and in these different conflicts its enemy became deprived of almost all its claws: it carried these away, and retired to its former situation to devour them. The meagre one had likewise lost three of its own claws, on which also it fed; and M. le Vaillant perceived that by this repast its plumpness was in some measure restored. The day following, the new comer, deprived of all its means of defence, fell a complete sacrifice. It was speedily devoured; and in less than twenty-four hours the old inhabitant of the bell became as plump as it was at the first moment of its confinement.

The females lay six or seven hundred eggs in bags, which they make on purpose, lined within side by a down which they pluck from their own breast. These bags, when completed, are thick as paper, smooth within side, but rougher without. The eggs are generally deposited in August or September, and about sixteen days afterward the young are hatched. If the weather continue cold, the young remain in their nidus for several months without eating or increasing in bulk; but make their appearance abroad on the commencement of the warm weather. The old ones live but a short time after the eggs are laid.

From these bags an attempt has been made to manufacture a kind of silk, which has in some degree proved successful. With some trouble thirteen ounces of these bags were collected. They were beaten for some time with a stick to free them from dust, and then washed in warm water till they were perfectly clean. After this they were steeped in a pot with soap, nitre, and gum arabic, and then boiled in the same mixture over a gentle fire for two or three hours. Clean warm water was again used to free them from the soap, &c.; and, after having been laid for some days to dry, they were loosened with the fingers previously to being carded by the common silk-carders. A beautiful ash-colored silk was thus obtained, easy to be spun, and much stronger in the thread than that of the silkworm. This was woven in a stocking weaver's loom, and there can be no doubt but that it would bear any other loom. The thirteen ounces of bags yielded near four ounces of silk, three of which made a pair of stockings large enough for a man. Had there not been insurmountable difficulties attending this task, we should have had from the different species of spiders several genuine colors in silk; such as grey, white, sky-blue, and coffee color; whereas silkworms yield only white and orange color. There are about fifty species of the spider, of which the following, besides those already mentioned, are the most remarkable.

The jumping spider is very singular in its manners. It does not, like many others, take its prey by means of a net, but is constrained to seize them only by its own activity. It is extremely nimble, at times leaping like a grasshopper, then standing still, and raising itself on its hind legs to look around for its prey. If it see a fly at the distance of three or four yards, it does not run directly to it, but endeavors, as much as possible, to conceal itself till it can arrive near; and then creeping slowly up, and but seldom missing its aim, it springs upon the insect's back, and it is then almost impossible for the fly to effect an escape; but if, before the spider gets to it, the fly take wing and fix upon another place, the little animal whirls nimbly about, and still keeps its eyes upon it, in order to commence a fresh attack. Dr. Brookes says, it has been sometimes seen in the act of instructing its young ones how to hunt; and also that, whenever an old one missed its leap, it would, as if ashamed of its mismanagement, run from the place, and hide itself in some crevice.

The water spider, which is a very common inhabitant of our fresh waters, appears, when in that element, as if covered with a silver varnish. This is, however, nothing more than a bubble of air attached to the abdomen by the oily humors which transpire from the body, and prevent the immediate contact of the water. By means of this kind of bubble the insect forms its dwelling under the water. It fixes several silky threads to the stalks of the water-plants, and then, ascending to the surface, thrusts the hinder part of its body above the water, drawing it back with so much rapidity as to attach beneath a bubble of air, which it has the art of detaining below, by placing it under the threads above mentioned, and which it bends, like a covering, almost round it. It then again ascends for another air bubble, and thus proceeds till it has constructed a large aërial apartment under the water, which it enters into or quits at pleasure. The figure of this spider has in it nothing remarkable. The male constructs for himself a bubble near that of the female, and afterward breaks through the thread walls of the female's dwelling; and the two bubbles, attached to the bellies of both, unite into one, forming one large chamber. The female takes care of the young, and constructs similar apartments for them. During the winter, both male and female lodge in empty shells, which they dexterously close up with a web.

The gossamer spider, supposed to be a species of field spider, is so small and active as to be imperceptible, unless the observer possess a very acute sight. It is about the size of the head of a small pin. Its head is somewhat long, and has in the fore part eight grey eyes, placed in a circular form. The body is of a shining dark brown color, with the abdomen shaped like an egg. The legs are yellowish. These little animals have the power of shooting out webs from their tails, so as to render themselves buoyant and lighter than air; and being also capable of coiling and thickening these webs when in the air, they have occasioned such showers of cobwebs as, till the cause was discovered, to create many strange suppositions. By one of these showers, which extended some miles, Mr. White was prevented from hunting, Sept. 21, 1741, his dogs having been thereby absolutely blinded and hoodwinked.

These spiders first appear in the beginning of October, in woods, gardens, and meadows, where their eggs are hatched in safety: thence they spread themselves over whole districts, and, during the rest of October, and till the middle of November, may be found in dry fields throughout Europe. Extensive tracts of land are sometimes seen swarming with them. In the begining of October, when but very few are hatched, some single threads of their webs, extending from twig to twig, are seen only in the sunshine; about the middle of the month their threads are more perceptible; and toward the end, if a person stand in such a position as to see the sunbeams play on the slender threads, hedges, meadows, corn-fields, stubble land, and even whole districts, appear covered as with a sort of fine white gauze.

These little animals do not weave webs, but only extend their threads from one place to another. These threads are so delicate, that not one can be seen unless the sun shines upon it. One of them, to be visible at other times, must be composed of at least six common threads twisted together. In serene calm days these spiders work with great diligence, especially after the disappearance of the morning fogs. Between twelve and two, however, their industry excites the greatest admiration: a person with a pretty quick eye, or by the help of a glass, may sometimes perceive among the barley-stubble such a multitude of these insects extending their threads, that the fields appear as if covered with swarms of gnats.

Several of the single threads become twisted together by the gentlest breath of wind, and form perceptible threads, which, being broken by stronger winds, unite into thick threads, or even into balls, and float through the atmosphere. These are then called, in Germany, the Flying Summer, because the summer seems to fly away at the same time. The spiders are conveyed in them; but it is not uncommon to find spiders of other species in them, which have been entangled and dragged away; and even the webs of other spiders, and the dried husks of insects that have been caught by them, are often found in the gossamer.

Gossamer spiders appear in swarms only during the harvest, but single spiders are to be found through the whole summer.

The diadema is the largest spider this country produces; the abdomen is of an oval form, downy, and of a ruddy yellow color, which is very variable in different seasons, being sometimes paler, and at others very dark colored; the upper part is beautifully adorned with black and white circles and dots, so arranged as to resemble a fillet, similar to those worn by the eastern kings; the ground upon which this fillet and the white dots are laid, when viewed with a glass, and the sun shining thereon, is beautiful and rich beyond all description. There are varieties in color of this spider when young; some have their abdomen purple, ornamented with white dots, the legs yellow, and annulated with a deeper color; others have their abdomen of a fine red, likewise ornamented with white, but the legs of a fine pale green color, annulated with dark purple, or black. It inhabits the birch trees.

The wandering spider is generally of a yellow color, more or less deep; sometimes it is whitish, and even rather green; the abdomen is large, broad, almost square, with two bands of dark orange, which arising from the thorax descends obliquely on the sides towards the middle. Between the bands are a few small black dots, forming a kind of triangle upon the middle of the abdomen; on the thorax are seen two longitudinal bands somewhat green, one on each side; the two foremost pair of legs are very long, and the hinder short, which makes it walk like a crab; it is found upon plants, and is a very lively, active, indefatigable hunter. Without any motion of the head, which is furnished with immovable eyes, it perceives all the flies that hover round about, does not scare them, but stretches over them its arms furnished with feathers, which prove nets in which their wings are entangled. The spider then seizes them with its merciless claws, and sucks their blood. It is said to sit on its eggs, which, however, it often conveys about with it, wrapt up in a ball of white silk.

The bird-catching spider is of gigantic size, and great muscular power, extending with its feet a space of near ten inches. From the head to the extremity of the abdomen it often measures above three inches. The legs are as thick as a goose's quill, and closely covered with hair. The body is brown, and the fangs are as strong and sharp as in some of the rapacious species of birds. It is not uncommon in many parts of America, but is principally found in the southern division of that continent, and particularly in Guiana, and is a terror to all the feathered tribes. It resides in the trees, and frequently seizes on small birds, which it destroys by sucking their blood, after having first wounded them by its fangs, which distil a poisonous liquid into the wound. The slit or orifice near the tip of the fangs, through which this poison is emitted, is so visible as to be distinctly perceived without a glass. The eight eyes of this terrible insect are placed somewhat in the form of an oblong square in the front of the thorax. Of these the two middle ones are so large as to be capable of being set in the manner of glasses, and used as microscopes; the rest are smaller, and of an oval shape. The thorax is orbicular, and has a transverse central excavation.

Captain Stedman, while residing in Surinam, had one of them given to him, which he put into a case-bottle above eight inches high; and, when this was filled with spirits, the animal reached the surface with some of its claws, while others rested on the bottom. On the whole, he says, this spider is so hideous a creature, that the very sight of it is sufficient to occasion a tremor of abhorrence, even in persons most accustomed to inspect the deformities of nature.

The fasciata is a native of Barbary, and is as large as a man's thumb. It has yellow bands round the belly, and dusky rings round the legs. It inhabits hedges and thickets. Its webs have large meshes, and it resides in the centre; the snares are spread for large flies, wasps, drones, and even locusts; the lesser insects can escape through the meshes. The animal which it entangles is soon bound with strong threads, killed by the spider's jaws, and partly eat, if the spider be hungry; the rest is concealed under some neighbouring dry leaves, covered with a kind of web and a blackish glue in great abundance; its larder is said to be often plentifully stored. Its nest is of the size of a pigeon's egg, divided horizontally, and suspended by the threads of the insect, which are of a silvery white, and stronger than silk. The young ones live in amity, but when grown up are mortal enemies; they never meet but they fight with violence, and their battle only ends with the death of the weakest; the dead body is carefully stored in the larder. Twelve of these spiders, by way of experiment, were shut up together, and after a battle of eight days, the strongest only remained alive.

Dampier informs us that, at Campeachy in New Spain, there "is a sort of spiders of a prodigious size, some nearly as big as a man's fist, with long small legs, like the spiders in England. They have two fangs, each an inch and a half long, and of a proportionable thickness, which are black as jet, smooth as glass, and at their small end as sharp as a thorn; these are not straight, but bending. Some persons wear them in their tobacco-pouches to pick their pipes with; others preserve them for tooth-picks, especially such as are troubled with the tooth-ach; for, if report may be trusted, they will expel that pain. The backs of these spiders are covered with a dark yellowish down as soft as velvet. Some say they are venomous, and others that they are not, but which of these accounts is to be credited I cannot determine."

In Jamaica there is a species of spider, the female of which digs a hole in the earth obliquely downward about three inches in length, and one in diameter; this cavity she lines with a tough, thick web, which, when taken out, resembles a leathern purse; but, what is most curious, this house has a door with hinges, like the operculum of some sea-shells; and herself and family, who tenant this nest, open and shut the door whenever they pass or repass.

The webs of spiders have been found in some places in the forests of Java, woven with threads of so strong a texture as not easily to be divided without a knife.

## THE TARANTULA

IS somewhat more than an inch in length, and has its breast and belly of an ash color; its legs are likewise ash-colored, with blackish rings on the under part. Its fangs are red within. Two of its eyes are red, larger than the others, and placed in the front; four other eyes are placed in a transverse direction towards the mouth; the other two are nearer the back. It has two antennæ, or feelers.

The tarantula is a native of Italy, Cyprus, Barbary, and the East Indies. It lives in fields, and its dwelling is about four inches deep, half an inch wide, and closed at the mouth with a net. At the bottom this is curved; and there the insect sits in wet weather, and from thence cuts its way out, if water gain upon it. It weaves a net at the mouth of the hole. These spiders do not live quite a year; they lay about 730 eggs, which are hatched in the spring. The parents never survive the winter.

The bite of the tarantula is said to occasion an inflammation in the part, which in a few hours brings on sickness, difficulty of breathing, and universal faintness. The person is afterwards afflicted with a delirium, and sometimes is seized with a deep melancholy. The same symptoms return annually, in some cases, for several years, and at last terminate in death. Music, it has been pretended, is the only cure. A musician is brought, who tries a variety of airs, till at last he hits upon one that urges the patient to dance; the violence of which exercise produces a proportionable agitation of the vital principles, attended with a consequent degree of perspiration, the certain consequence of which is a cure. Such are the circumstances which have been generally related, and long credited, concerning the bite of this animal. Kircherus, in his "Musurgia," gives a very particular account of the symptoms and cures, illustrated by histories of cases. Among these he mentions a girl who, being bitten by this insect, could be cured only by the music of a drum. He then proceeds to relate, that a certain Spaniard, trusting to the efficacy of music in the cure of the frenzy occasioned by the bite of the tarantula, submitted to be bitten on the hand by two of these creatures, of different colors, and possessed of different qualities; the venom was no sooner diffused about his body than the symptoms of the disorder began to appear; upon which harpers, pipers, and other musicians were sent for, who, by various kinds of music, endeavored to rouze him from that stupor into which he was fallen; but here it was observed that the bites of the two insects had produced contrary effects; for by one he was incited to dance, and by the other restrained therefrom; and in this conflict of nature the patient died.

The same author, attempting mechanically to account for the cure of the bite of the tarantula by music, says of the poison, that it is sharp, gnawing, and bilious, and that it is received and incorporated into the medullary substance of the fibres. With respect to the music, he says, that the sound of the chords have a power to rarify the air to a certain harmonical pitch; and that the air, thus rarified, penetrating the pores of the patient's body, affects the muscles, arteries, and minute fibres, and incites him to dance, which exercise begets a perspiration in which the poison evaporates.

Unsatisfactory as this theory appears, the belief of this strange phenomenon has prevailed among the ablest of modern physicians. Sir Thomas Brown, so far from disputing it, says, that since many attest the fact from experience, and that the learned Kircherus has positively averred, and set down the songs and tunes solemnly used for the cure of the disease; and since some also affirm that the tarantula itself will dance at the sound of music, he shall not at all question it. Farther, an eminent Italian physician, Baglivi, a native of Apulia, the country where the tarantula is produced, has written a dissertation, in which he describes the region of Apulia, where the tarantula is produced, with the anatomy and figure of the insect and its eggs; he mentions particularly the symptoms that follow from the bite, and the cure of the disease by music, with a variety of histories of cures thus wrought, many of them communicated by persons who were eye-witnesses of the process.

Ludovicus Valetta, a celestine monk of Apulia, published at Naples in the year 1709, a treatise upon this spider, in which he not only answers the objections of those who deny the whole circumstances, but gives, from his own knowledge, several instances of persons who had suffered this way, some of whom were of great families, and so far from being dissemblers, that they would at any rate, to avoid shame, have concealed the misfortune which had befallen them. The Hon. Mr. Robert Boyle, in his treatise of "Languid and Unheeded Motions," speaking of the bite of the tarantula, and the cure of the disease which follows it, by means of music, says, "that having himself had some doubts about the matter, he was, after strict enquiry, convinced that the relations in the main were true." Lastly, Dr. Mead, in his "Mechanical account of Poisons," has given an essay on the tarantula, containing the substance of the above relations, which he endeavors to confirm by his own reasoning thereon.

In the Philosophical Transactions for 1672, is an extract of a letter from Dr. Thomas Cornelia, a Neapolitan physician, to John Doddington, Esq. his Majesty's resident at Venice, communicated by the latter, in which, speaking of his intention to send to Mr. Doddington some tarantulas, he says, "Meanwhile I shall not omit to impart to you what was related to me a few days since, by a judicious and unprejudiced person, which is, that being in the country of Otranto, where these insects are in great numbers, there was a man who, thinking himself stung by a tarantula, shewed in his neck a small speck, about which in a short time there arose some pimples, full of a serous humor; and that in a few hours after the poor man was afflicted with very violent symptoms, as syncopes, very great agitations, giddiness of the head, and vomiting; but that without any inclination to dance, and without a desire to have any musical instrument, he miserably died within two days. The same person affirmed to me, that all those that think themselves bitten by tarantulas, except such as for evil ends feign themselves to be so, are for the most part young wanton girls, whom the Italian writers call *dolce di sale,* who, by some particular indisposition falling into this melancholy madness, persuade themselves, according to the vulgar prejudice, to have been stung by a tarantula."

Dr. Serao, an Italian physician, in a very ingenious work has effectually exploded this opinion as a popular error; and in the Philosophical Transactions for the year 1770, is a letter from Dominico Cirillo, M. D. Professor of Natural History in the University of Naples, wherein taking notice of Serao's book, he says, that having had an opportunity of examining the effects of this animal in the province of Taranto, where it is found in great abundance, he finds that the surprising cure of the bite of the tarantula by music has not the least truth in it, and that it is only an invention of the people, who want to get a little money by dancing when they say the tarantism begins. He makes no doubt but sometimes the heat of the climate contributes very much to warm their imaginations, and throw them into a delirium, which may be in some measure cured by music; but several experiments have been tried with the tarantulas, and neither man nor animal after the bite has had any other complaint than a very trifling inflammation upon the part, like that produced by the bite of the scorpion, which goes off by itself without any danger at all. In Sicily, where the summer is still warmer than in any part of the kingdom of Naples, the tarantula is never dangerous; and music is never employed for the cure of the pretended tarantism.

Mr. Swinburne, when he was in Italy, minutely investigated every particular relative to this insect; but the season was not far enough ad vanced, and no tarantati (persons bitten, or pretended to have been bitten, by the tarantula) had begun to stir. He prevailed, however, upon a woman who had been formerly bitten, to act the part and dance the tarantata (as it is called) before him. Many musicians were summoned, and she performed the dance, as all present assured him, to perfection. At first she lolled stupidly on a chair while the instruments were playing some dull music, they touched at length the chord supposed to vibrate to her heart; and up she sprung with a most hideous yell, staggered about the room like a drunken person, holding a handkerchief in both hands, raising them alternately, and moving in very true time; as the music grew brisker, her motions quickened, and she skipped about with great vigor, and variety of steps, every now and then shrieking very loud. The scene was far from pleasant, and at his desire an end was put to it before the woman was tired.

Wherever the tarantati are to dance, this gentleman informs us, a place is hung round with bunches of grapes and ribbons; the patients are dressed in white, with red, green, or yellow ribbons, for those are their favorite colors; on their shoulders they cast a white scarf, let their hair fall loose about their ears, and throw their heads as far back as they can bear it; they are exact copies of the ancient priestesses of Bacchus. The introduction of Christianity abolished all public exhibitions of these heathenish rites, and the women durst no longer act a frantic part in the character of Bacchantes. Unwilling to give up so darling an amusement, they devised other pretences, and possession by evil spirits may have furnished them with one. Accident may also have led them to a discovery of the tarantula; and upon the strength of its poison the Puglian dames still enjoy their old dance, though time has effaced the memory of its ancient name and institution; and this Mr. Swinburne takes to be the origin of so strange a practice.

## *THE SCORPION.*

THIS is one of the largest of the insect tribe, and has a distant resemblance in shape to the lobster, but is infinitely more ugly: it also casts its skin as the lobster does its shell. They have eight legs, besides two claws and eight eyes, three of which are placed on each side of the thorax, and two in the middle. The head appears, as it were, jointed to the breast; and the mouth is furnished with two jaws, the under one of which is divided into two, and the parts, notched into each other, answer the purpose of teeth in breaking the food. On each side of the head is a four-jointed arm terminated by a claw, somewhat like that of a lobster. The belly is divided into seven segments, from the lowest of which the tail commences; this, in the common species, is armed with a hard, pointed, and crooked sting, the poison of which is very powerful. There are about nine different kinds of this dangerous insect, chiefly distinguished by their colors, some being yellow, brown, and ash colored, others of a rusty iron, green, pale yellow, black, claret color, white, and grey. See the plate of insects, fig. 4. They are most common about old houses, and in dry or decayed walls.

Scorpions, which are very common in all hot countries, are extremely bold and watchful. Whenever any thing approaches, they seldom exhibit signs of fear, but, with their tail erect, and sting in readiness, as if fully confident of the force of their poison, they wait an attack with courage and intrepidity, and seldom desist till either they are killed or their enemy is put to flight. In some parts of Italy and France they are among the greatest pests that can plague mankind; but in those countries of the East where they grow to a foot in length, there is no removing a piece of furniture without danger of being stung by them. There they are said to be full as bulky as a small lobster. In Europe their general size does not exceed two or three inches, and their sting is very seldom found to be fatal.

Maupertuis, who made several experiments on the scorpion of Languedoc, found it by no means so invariably dangerous as had till then been represented. He provoked one of them to sting a dog in three places of the belly, which was without hair; in about an hour after the poor animal seemed greatly swollen, and he became very sick; he then cast up what he had in his stomach, and for about three hours continued vomiting a whitish liquid. His belly was always very much swollen when he began to vomit; this operation seemed to abate the swelling, which alternately increased, and was thus reduced for three hours successively. The poor animal after this fell into convulsions, bit the ground, dragged himself along upon his fore feet, and at last died, about five hours after he had been bitten. Some days after, however, the same experiment was tried upon another dog, and even with more aggravated cruelty, yet the dog seemed no way affected by the wounds, but, howling a little when he received them, continued perfectly alert, and was soon set at liberty, without shewing the smallest symptom of pain. The same experiment was tried, by fresh scorpions, upon seven other dogs, and three hens, but not the smallest deadly symptom was seen to ensue. From hence it appears that many circumstances, which are utterly unknown, must contribute to give efficacy to the scorpion's venom. Whether its food, long fasting, the season, the nature of the vessels it wounds, or its state of maturity, contribute to or retard its malignity, is yet to be ascertained by succeeding experiments. In the trials made by

M. Maupertuis, he employed scorpions of both sexes, newly caught, and apparently active and vigorous.

The scorpion of the tropical climates being much larger, is, probably, much more venomous. Helbigius, however, who resided for many years in the East, assures us that he was often stung by the scorpion, and never received any material injury from the wound; a painful tumor, he says, generally ensued, but he always cured it by rubbing the part with a piece of iron or stone, as he had seen the Indians, until the flesh became insensible. Seba, Moore, and Bosman, nevertheless, give a very different account of the scorpion's malignity; they assert that the wound is fatal if not immediately relieved. The place becomes inflamed, and the surrounding parts often turn livid, and require to be carefully dressed to prevent mortification.

The disposition of these creatures is exceedingly irascible. When taken they act with perfect fury; they rush against the sides of the vessel in which they are inclosed, and endeavor to sting every thing which comes near them. Maupertuis put three scorpions and a mouse in the same vessel together, and they all immediately stung the little animal in different places; the mouse, thus assaulted, stood for some time upon the defensive, and at last killed them all, one after the other, and even survived the severity of the wounds it had received. Wolkamer tried the courage of the scorpion against the large spider, and enclosed several of both kinds in glass vessels for that purpose. The spider at first used all its efforts to immesh the scorpion in its web, which it immediately began spinning; but the scorpion rescued itself from the danger by stinging its adversary to death; it soon after, with its claws, cut off the legs of the spider, and then suckled all the internal parts at its leisure. If the scorpion's skin had not been so hard, Wolkamer was of opinion that the spider would have obtained the victory, for he had often seen one of the same kind of spiders overcome and kill a toad.

Such is the ferocity of their temper, that they are the cruellest of enemies to each other. Maupertuis put about an hundred of them together in the same glass; and they scarcely came into contact, when they began to exert all their rage in mutual destruction: there was nothing to be seen but one universal carnage, and in a very few days there remained only fourteen, which had killed and devoured all the rest. But their unnatural malignity is still more apparent in their cruelty to their offspring. The above gentleman inclosed a female scorpion, big with young, in a glass vessel, and she was seen to devour them as fast as they were excluded; there was but one escaped the general destruction, and that it did by taking refuge on the back of its parent; and this soon after avenged the cause of its brethren by killing the old one in its turn. Such is the ferocious nature of this insect, that when driven to an extremity it will even, it is said, destroy itself. Goldsmith was informed by a person who made the experiment in America, and on whose veracity he could rely, that a scorpion, newly caught, being placed in the midst of a circle of burning charcoal, and thus an egress prevented on every side, it runs, for about a minute, round the circle, seeking for a place to escape, but finding that impossible, it stings itself on the back of the head, by which wound the undaunted suicide instantly expires. This account is (without any reason assigned) treated as fabulous by the Rev. Mr. Bingley.

The male and female scorpions can be very easily distinguished; the former being smaller and less hairy. The female brings forth her young alive, and perfect in their kind. Rhedi having procured a quantity of scorpions, selected the females from the rest, and putting them into separate glass vessels, he kept them a few days without food. In above five days one of them brought forth thirty-eight young ones, well shaped, and of a milk white colour, which changed every day more and more into a dark rusty hue. Another female, in a different vessel, brought twenty-seven of the same colour; and the day following the young ones seemed all fixed to the back and belly of the female. For near a fortnight all these continued alive and well, but afterwards some of them died daily, and in about a month they were all dead except two. These animals, however, might be kept living for a considerable time. Their chief food is worms and insects, and upon a proper supply of those their lives would, most probably, be preserved to their natural extent.

There is a scorpion of America produced from the egg in the manner of the spider. The eggs are not larger than the point of a pin, and they are deposited in a web which they spin from their bodies, and carry about with them, till they are hatched. As soon as the young ones are excluded from the shell, they get upon the back of the parent, who turns her tail over them, and defends them with her sting.

## *THE FLEA.*

THIS insect, though exceedingly troublesome, and universally despised, is by no means disagreeable in appearance. When examined by a microscope, it will be observed to have a small head, large eyes, and two four-jointed antennæ, between which is the trunk or proboscis. The body appears to be all over curiously adorned with a suit of polished sable armour, neatly jointed, and beset with a great number of sharp pins, almost like the quills of a porcupine. It has six legs, the joints of which are so adapted, that i can, as it were, fold them up one within another, and when it leaps they all spring out at once, whereby its whole strength is exerted, and the body thrown, comparatively, to a considerable distance. See the plate of Insects, fig. 1. Its power of springing is wonderful for its size, being capable of bounding more in height than two hundred times the bulk of its whole body; and some naturalists have been induced to attribute to it a no less extraordinary degree of cunning and sagacity, for they say that it makes its approach for an attack with as much caution, as it effectuates its escape with art and velocity. But this is possibly allowing the flea a greater share of instinct than it, in reality, has any pretensions to; for although it certainly appears to exert a variety of manœuvres to save its life, and to preserve its freedom, yet that may probably be accounted for in the diminutiveness of its size, and the elasticity of its limbs; and as to its precaution in making its attacks, whatever individuals may have supposed they had observed, the flea hastily approaches the body that is warm, and greedily attacks those pores through which the blood can most easily be procured. The strength of this animal is also astonishing for its size. A flea will drag after it a chain a hundred times heavier than itself: and, to compensate for this force, will eat ten times its own weight of provisions in a day. Mr. Boverich, an ingenious watchmaker who some years ago lived in the

Strand, London, exhibited to the public a little ivory chaise, with four wheels, and all its proper apparatus, and a man sitting on the box, all of which were drawn by a single flea. He made a small landau, which opened and shut by springs, with six horses harnessed to it, a coachman sitting on the box, and a dog between his legs; four persons in the carriage, two footmen behind it, and a postillion riding on one of the fore-horses, which was also easily drawn along by a flea. He likewise had a chain of brass, about two inches long, containing two hundred links, with a hook at one end, and a padlock and key at the other, which the flea drew very nimbly along.

Fleas are produced from eggs which the females stick fast, by a kind of glutinous matter, to the roots of the hairs of cats, dogs, and other animals; or to the wool in blankets, rugs, or other similar furniture. Of these eggs the female lays ten or twelve a day, for several days successively; and they are hatched in the same order five or six days after being laid. From the eggs come forth, not perfect fleas, but little whitish worms, or maggots, whose bodies have annular divisions, and are thinly covered with long hairs. They adhere closely to the body of the animal, on which they were produced; and feed on the scurfy excretion of the skin, the downy substance of linen, &c. They are about a fourth of an inch in length, and without feet;

but they are, notwithstanding, very lively and active. When alarmed they suddenly roll themselves up into the shape of a little ball. They may be kept in a little box, and brought up with dead flies, which they eat with greediness. In eleven days from their being hatched, they leave off eating, and lie as though they were dying; but, if viewed in this state with a microscope, they will be found weaving a silken covering around them, in which they are to change into their chrysalis form. They continue nine days in this shape, at first white, and afterwards by degrees darkening their colour as they acquire firmness of strength. As soon as they issue from their bug they become perfect fleas, and and are able to leap away.

Fleas abound in warm climates, particularly in the southern parts of France and Italy, and they are not only troublesome to mankind, but likewise to domestic animals, such as dogs, cats, poultry, &c.

## *THE LOUSE.*

THE external deformity of this insect, which is one of misfortune's train, if examined by a microscope, as in the plate of insects, fig. 2. strikes us with disgust; the shape of the fore-part of the head appears to be somewhat oblong; that of the hind-part somewhat round; the skin is hard, and being stretched, transparent, with here and there several bristly hairs; in the fore-part is a proboscis, or sucker, which is seldom visible: on each side of the head are two antennæ, or horns, each divided into five joints, covered with bristly hair; and several other white vessels are seen through these horns; behind these are the eyes, which seem to want those divisions observable in other insects, and appear encompassed with some few hairs; the neck is very short, and the breast is divided into three parts; on each side of which are placed six legs, consisting of six joints, covered also with bristly hairs; the ends of the legs are armed with a large and a small ruddy claw, serving them as a finger and thumb, by which they catch hold of such objects as they approach; the end of the body terminates in a cloven tail, while the sides are covered with hair, the whole resembling clear parchment, and, when roughly pressed, cracking with a noise.

The louse has neither beak, teeth, nor any kind of mouth. In the place of all those it has a proboscis, or trunk; or as it may otherwise be called, a pointed hollow sucker, with which it pierces the skin, and sucks the human blood, taking that alone for food. The stomach is lodged partly in the breast and back; but the greatest portion of it is in the abdomen. When empty it is colourless, but when filled it is plainly discernible, and its motion seems very extraordinary. It then appears working with very strong agitations, and somewhat resembles an animal within an animal.

Superficial observers are apt to take this for the pulsation of the heart; but if the animal be observed when sucking, it will then be seen that the food takes a direct passage from the trunk to the stomach, where the remainder of the old aliment may be observed mixing with the new, and agitated up and down on every side. If this creature be kept from food two or three days, and then placed upon the back of the hand, or any soft parts of the body, it will immediately seek food; and which it will the more readily find if the place be rubbed until it grows red. The animal then turns its head, which lies between the two fore-legs, to the skin, and diligently searches for some pore; when found it fixes the trunk therein, and soon with the microscope, the blood may be discovered ascending through the head in a very rapid stream. The louse will, at that time, feed in any posture, even with its head downward, and its tail elevated. If, during this operation, the skin be drawn tight, the trunk becomes bound fast, and the animal is incapable of disengaging itself; but it more frequently suffers from its gluttony, since it gorges to such a degree that it is crushed to pieces with the slightest impression.

Scarcely any creature multiplies so quickly as this unwelcome intruder. It has been humourously said that a louse becomes a grandfather in the space of twenty-four hours. This fact cannot be ascertained; but nothing is more true than that the moment the nit, which is no other than the egg of the louse, gets rid of its superfluous moisture, and throws off its shell, it begins to breed in its turn. Nothing so much prevents the increase of this nauseous animal as cold, and want of humidity. The nits, unless they are laid in a place that is warm, do not produce any thing; and from this it is that many of the nits laid on the hairs in the night-time are destroyed by the cold of the succeeding day.

Lice were formerly so numerous in Mexico, that the ancient kings found no other means of ridding their subjects of them than by the imposition of an annual tribute of a certain quantity. Ferdinand Cortes found bags full of them in the palace of Montezuma.

This nauseous insect is equally troublesome on every part of the human body, and among the ancients what is called the phiriasis, or lousy disease, was not uncommon; Antiochus, Herod, Epiphanes, Alcman the poet, Pherecydes, Cassander, Callisthenes, Sylla, and several others are said to have died of that disorder. The use of mercury, which was unknown among the ancients may probably have relieved the moderns.

This tribe of insects is so general, that there is scarce an animal or vegetable which does not suffer the persecutions of its own peculiar louse. The sheep, the horse, the hog, and the elephant are all teazed by them: the whale, the shark, the salmon, and the lobster, are not without their company; while every hot-house, and every garden is infested with some peculiarly destructive.

## THE LEAF LOUSE.

THIS animal is of the size of a flea, and of a bright green, or bluish green colour; the body is nearly oval, and is largest and most convex on the hinder part; the breast is very small, and the head is blunt and green; the eyes may be seen very plainly, being prominent on the fore-part of the head, and of a shining black colour; near these there is a black line on each side; and the legs are very slender. Like many other insects, they cast their skins four several times; and, what is very remarkable, the males have four wings, but the females never have any. They all have long legs, not only to enable them to creep over the long hairs of plants and leaves, but also to travel from one tree to another, when they happen to stand at a distance. Their trunk, or snout, lies under their breast; and this they thrust into the pores of the plant to suck out the juice, for they do not gnaw them, like the caterpillar; but so hurt them by sucking, that the leaves become spotted, and as it were over-run with scabs: for which reason their edges always turn towards the middle.

These lice, or aphides, are usually found upon the leaves of the orache, and other plants; and the weaker the leaves and buds are, these insects swarm upon them in greater abundance. Some plants are covered over with them; though they are not the cause of the plant's weakness, but the sign: however, by wounding and sucking the leaf, they increase the disease. They generally assume their colour from the plant on which they reside. Those that feed upon pot-herbs and plumb-trees, are of an ash-colour; only they are greenish when they are young; those that belong to the alder and cherry-tree, are black; as are also those upon beans, and some other plants: those on the leaves of apples and rose-trees, are white; but as they leap like grasshoppers, some place them in the number of the flea kind. The most uncommon colour is reddish; and lice of this sort may be found on the leaves of tansey; and their juice, when rubbed in the hands, tinges them with no disagreeable red. All these live upon their respective plant; and are often engendered within the very substance of the leaf.

These are viviparous insects; the fœtus, when it is ready to be brought forth, entirely fills the belly of the female; its fore-parts being excluded first, and then the hinder. The young one does not begin to move till the horns, or feelers, appear out of the body of the old one; and by the motion of these it first shows signs of life, moving them in every direction, and bending all their joints. When the horns and head are excluded, the two fore-feet follow, which they move with equal agility; after this follow the middle feet, and then the hinder: still, however, the young one continues sticking to its parent, supported only at one extremity, and hanging, as it were, in air, until its small and soft members become hardened and fitted for self-support. The parent then gets rid of its burthen, by moving from the place where she was sitting, and forcing the young one to stand upon its legs, leaves it to shift for itself. As the animal has not far to go, its provision lying beneath it, during the summer it continues to eat and creep about with great agility. But as it is viviparous, and must necessarily lurk somewhere in winter, where its body may be defended from the cold, it endeavours to secure a retreat near the trees or plants that serve to nourish it in the beginning of spring. They never hide themselves in the earth, like many other insects, because they have no part of their bodies fitted to remove the earth; nor can they creep into every chink, as their legs are too long; besides, their bodies are so tender, that the least rough particle of the earth would hurt them. They therefore get into the deep chinks of the bark, and into the cavities of the stronger stalks, whence they sally out upon the branches and leaves, when the warmth of the sun begins to be felt. Neither the cold in the autumnal season, nor the lesser degree of heat in the spring, ever hurts them; they seldom, therefore, seek for hiding-places before the fall of the leaf, and are alert enough to take the earliest advantage of the returning spring.

## THE CHIGOE.

THIS troublesome insect, which is a kind of small sand flea, is so diminutive as to be almost imperceptible. Its legs have not the elasticity of those of fleas; for had the chigoes their powers of leaping, there is not a living creature of the climates where they abound that would not be full of them; and this lurking race would destroy three fourths of mankind by the evils they would produce. They are common in Surinam, and in many parts of America, and are always found among the dust, and particularly in filthy places; they fix themselves on the legs, to the soles of the feet, and even to the fingers.

The chigoe gets in between the skin and the flesh, and generally under the nails of the toes, in such a subtle manner, that at the time the person is not sensible of it; nor is it to be perceived till it begins to extend itself. At first it is not difficult to extract it; but, although it may only have introduced its head, it makes so firm a lodgment that a part of the skin must be sacrificed before it will quit its hold. If it be not soon perceived, the insect completes its lodgment, sucks the blood, and forms a nest of a white thin tunicle, in the shape of a flat pearl. It extends itself in this space in such a manner that its head and feet are toward the exterior side, for the convenience of nourishment; and the other part of the body answers to the inner side of the tunicle, in order to lay its eggs there. In proportion as these are laid, the little pearl is enlarged; and in four or five days it is at least two lines in diameter. It is then of the utmost consequence to have it extracted; for if this be neglected it bursts of itself, and spreads an infinity of nits, which when hatched, fill the whole part, and produce excessive anguish; and the difficulty of dislodging them becomes very great. These penetrate to the very bones; and, even when the sufferer has got rid of them, the pain will last till the flesh and skin are entirely healed.

The operation of extracting them, at which the black girls are extremely dexterous, is long and painful. It consists in separating, with the point of a needle, the flesh next to the membrane where the eggs are lodged; which is not easily done without bursting the tunicle. After having separated even the most minute ligaments, the nest is to be extracted. If unfortunately it burst, particular care must be taken to extract every root of it, and especially not to leave behind the principal insect. This would begin to lay its eggs again before the wound could be healed; and, penetrating much farther into the flesh, would increase the difficulty of extracting. During the great heats extreme care must be taken not to wet the part affected. Without this precaution, experience has proved that the patient is subject to consequences that frequently prove fatal. Tobacco ashes are put into the orifice, by which, in a little time, the sore is perfectly healed. Some, by having neglected in time to root out these detestable vermin, have not only lost their limbs by amputation, but even their lives.

## *THE COMMON BUG.*

THE common bug has a flat back, and legs formed for running. The rostrum is inflected, and the antennæ longer than the thorax. It conceals itself by day in crevices and other retired places, but runs about with considerable agility in the night to suck the blood of persons that are asleep. Some, however, they will not bite, but annoy them by walking over their faces, and by their abominable smell.

These nauseous and disagreeable animals are supposed to have been first introduced to this country in the fir timber that was brought over to rebuild London after it had suffered by the great fire; for it is generally said that bugs were not known in England before that time; and many of them were found almost immediately afterwards in the new-built houses. Their most favourite food is blood, dried paste, size, deal, beech, osier, and some other kinds of timber, the sap of which they suck; and on any of these they are able to exist. They will not feed on oak, walnut, cedar, or mahogany; for several pairs that, for the sake of experiment, were confined with these kinds of wood soon died, whilst those kept with the others continued to thrive through the whole year.

The female generally lays about fifty eggs at a time, which are white, and, when protruded, are covered with a viscous matter, which, afterwards hardening, sticks them firmly to the place where they are deposited. These are usually hatched in about three weeks. The general times of laying are March, May, July, and September: so that from every female bug that outlives the season, as many as two hundred young may be produced. The first young begin to burst from their eggs early in spring, and frequently in February. For some time after they first escape from the egg, they are perfectly white, but they generally become brown in the course of about three weeks. In eleven weeks they are at full growth. They are then very watchful and cunning creatures; and so fierce, among their own species, that they will sometimes contend with the utmost fury; and in their combats they seldom leave off till either one or both of them are killed. Spiders are very fond of them, and often seize them for food.

Beds infested by bugs ought to be stripped early in the year of all their furniture, which should be washed, and, if linen, even boiled, or if stuff, hot-pressed. The bedsteads should be taken in pieces, and dusted, and washed with spirits of wine, or turpentine, in all the joints and crevices, for it is in these parts principally that the females deposit their eggs. This done, all the cavities should be well filled with the best soft soap, mixed up with verdigrease and Scotch snuff. On this composition the young will immediately feed, after leaving the egg (if any escape the cleansing) and will be destroyed, as will also such of the old ones as happen to be left.

These creatures abound in all the hot climates, from whence most of our merchant-vessels are over-run with them. It is supposed that they do not altogether lie torpid during the winter, but that in the cold weather they require less nutriment, and therefore that they are not tempted to come so often out of their retreats as they do in the warmer seasons of the year.

The paradoxical bug which was seen by Dr. Sparman at the Cape of Good Hope, resembles, in shape and colour, the fragment of a withered leaf, with the edges turned up and eaten away, as it were, by caterpillars, and at the same time all over beset with prickles. Nature, by this peculiar form, has certainly extremely well defended, and concealed, as it were in a mask, this insect from birds and its other diminutive foes; in all probability with a view to its preservation, and to employ it for some important, but unknown, office in the system of economy.

## THE CENTIPEDE.

THIS is the most formidable in appearance of all the insect tribe, scorpions excepted. It is found in the East and West Indies, and in various parts of Africa, inhabiting chiefly the woods, where it is preyed upon by the different species of snakes. It is sometimes found in houses, and is said to be so common in particular districts that the inhabitants are obliged to have the feet of their beds placed in vessels of water, to prevent their being annoyed during the night by these horrible reptiles.

They vary greatly both in size and colour. Some of them are of a deep reddish brown, others of a yellow ochre colour, livid yellow, or tinged with red; and they are sometimes seen above a foot in length; they are, however, generally much less. Their legs, which are numerous, according to their name, terminate in very sharp hooks or nails of a shining black colour; and all the other legs are furnished with smaller ones of the same kind. They have eight very small eyes, four on each side of the head, near the antennæ. The number of segments of the body increase with their age, so that from this circumstance it is sometimes difficult to ascertain the species.

We are told by Gronovius, that all the feet are venomous; but the most formidable weapons of this creature are the two sharp hooked instruments, that are placed under the mouth, with which it destroys its prey. At the extremity of each of these there is a small opening, and from thence extends a tube through which it is supposed the centipede emits the poisonous fluid into the wound inflicted by these fangs. In order to ascertain the influence of this poison, Leuwenhoek placed a large fly within the reach of a centipede, who seized it between a pair of the middle feet, then passed it from one pair to the next, till it was brought under the fangs; which were plunged into its body, and it died instantly. St. Pierre says, that, in the Isle of France his dog was bitten by one of them that was upwards of six inches in length, and that the wound turned to an ulcer, which was three weeks in healing. He was highly diverted in observing one of them overcome by a vast number of ants, that attacked it in conjunction, and, after seizing it by all its legs, bore it along as workmen would have done a large piéce of timber. Its poison is not more injurious than that of the scorpion, and very seldom proves fatal to the larger animals.

It is asserted by Sir George Staunton, that such was the horror excited in the minds of some of Lord Macartney's train by the sight of these creatures in China, that many thought them alone a sufficient objection to the country.

## TICKS.

THE mouths of these troublesome insects is not furnished with proboscis, but the sucker has a two-valved cylindrical sheath. They have two compressed feelers as long as the sucker; two eyes, one on each side of the head, and eight legs.

Ticks live chiefly on other animals; some of them, however, inhabit the water, and others subsist on various vegetable substances. They are to be found every where, and in immense numbers. The larvæ and chrysalids have each six feet.

## CHEESE-MITES.

THESE minute creatures appear to the naked eye little more than moving particles of dust; but when magnified by the microscope they are found to be perfect animals, performing all the regular functions. The head is small in proportion to the rest of the body. Their legs are furnished at the extremities with little claws, by which they are enabled to lay firm hold of the substances they inhabit. The body is furnished with long hairs, which they have the power of depressing; and by this means they are enabled to creep through crevices that would not otherwise admit them.

The females, which are easily distinguished from the males, are oviparous. The eggs are so minute, that, on a tolerably accurate calculation, it appeared that ninety millions of them would not fill the shell of a pigeon's egg. These are hatched in warm weather in about twelve days; but during the winter season the time of hatching is much longer. When the young ones first come forth they are extremely minute, and before they attain their full size they cast their skin several times.

These little animals are very quick-sighted; and when once they have been touched with a pin, it is easy to perceive a great degree of cunning exerted to avoid a second touch. They are extremely voracious, and are frequently observed even to devour each other: and so very tenacious are they of life that they have been kept alive many months between two concave glasses, by which they were applied to a microscope. Leuwenhoek placed a female mite on the point of a pin for examination: she remained there ten days, and during the time laid two eggs; which, for want of other food she devoured.

## *THE HARVEST-BUG.*

THE harvest-bug, which is smaller than the common mite, and by its colour but just to be perceived when on the skin, is of a somewhat globular shape, and of a bright red colour, with the abdomen bristly behind. It is very troublesome in the months of August and September, adhering to the skin by means of two short arms situated above the upper legs, so firmly as not easily to be disengaged. Wherever it fixes it causes a tumour about the size of a pea, or larger, accompanied by a most unpleasant itching. Its tubular snout, by which it takes its food, is generally concealed.

Harvest-bugs abound in vegetables, and are generally caught from walking in gardens, among long grass, or in corn-fields. There are such immense numbers of them, according to Mr. White, on the chalky downs of Hampshire, that the warreners' nets are frequently discoloured by them: whilst the men are sometimes so bitten as to be thrown into fevers.

## CHAP. VI.

> "Around in sympathetic mirth
> Its tricks the kitten tries,
> The *cricket* chirrups in the hearth,
> The crackling faggot flies."
>
> GOLDSMITH.

## THE CRICKET.

THE house-cricket, the voice of which is so well known behind a country-fire in a winter's evening, resembles the grasshopper in its shape, its manner of ruminating, its voice, its leaping, &c. It differs, however, in its colour, which is uniformly of a rusty brown; in its food, which is more various, and in its place of residence, which is most usually in the warmest chinks behind a country hearth. The smallest chink serves to give them shelter; and where they once make their abode they are sure to propagate. They are of a most chilly nature, seldom leaving the fire-side; and, if undisturbed, are seen to hop from their retreats to chirp at the blaze in the chimney. The wood-cricket is the most timorous animal in nature; but the chimney-cricket, being used to noises, disregards them.

The noise that produces the chirping (as it is called) is a membrane, which, in contracting by means of a muscle and tendon, placed under the wings of the insect, folds down somewhat like a fan. This, as it is always dry, yields that sharp piercing sound that we so often hear from these animals. The noise may also be heard after the insect is dead, if the tendon be made to move. Indeed it is said that crickets will live, and continue their accustomed noise after their heads are cut off.

As the cricket lives chiefly in the dark, so its eyes seem formed for the gloominess of its abode; and those who would surprise it, have only to light a candle unexpectedly; by which it is dazzled, gives two or three shrill notes, and cannot find the way back to its retreat. These shrill notes seem to be a signal to their fellows that they may flee to their crannies and lurking holes to avoid danger.

The cricket is a very voracious little animal, and will eat bread, flour, and meat; but is particularly fond of sugar. They never cease chirping but when affected by cold. They never drink, but keep for months together at the back of the chimney. Yet the Rev. Mr. White says, "One would suppose from the burning atmosphere which they inhabit, they are a thirsty race, and show a great propensity for liquids, being found frequently drowned in pans of water, milk, broth, or the like. Whatever is moist they are fond of, and therefore often gnaw holes in wet woollen stockings and aprons that are hung to the fire. These crickets are not only very thirsty but very voracious; for they will eat the scummings of pots, yeast, salt, and crumbs of bread; and any kitchen offal or sweepings.

"In the summer they have been observed to fly, when it became dusk, out of the windows, and over the neighbouring roofs. This feat of activity accounts for the sudden manner in which they often leave their haunts, as it does also for the method by which they come to houses where they were not known before. It is remarkable that many sorts of insects seem never to use their wings but when they wish to shift their quarters and settle new colonies. When in the air they move in waves or curves, like wood-peckers, opening and shutting their wings at every stroke, and thus are always rising or sinking. When they increase to a great degree, they become pests, flying into the candles, and dashing into people's faces; but they may be blasted by gunpowder discharged into their crevices and crannies. In families, at such times they are like Pharaoh's plague of frogs—'in their bed-chambers, and upon their beds, and in their ovens, and in their kneading troughs.'

"Cats catch hearth-crickets, and, playing with them, as they do with mice, devour them. Crickets may be destroyed like wasps, by phials half filled with beer, or any liquid, and set in their haunts; for, being always eager to drink, they will crowd in till the bottles are full."

A popular prejudice, however, frequently prevents any attempts at their destruction, many people imagining that their presence is attended with good luck, and that to kill or drive them away will surely bring some unfortunate occurrence on the family.

The great Scaliger was particularly delighted with the chirping of crickets, and kept several of them for his amusement, enclosed in a box, which he placed in a warm situation. Others, on the contrary, think there is something ominous and melancholy in the sound, and use every endeavour to banish this insect from their houses.

Ledelius tells us of a woman who was very much incommoded by crickets, and tried, but in vain every method of banishing them from her house. She at last accidentally succeeded; for having one day invited several guests to her house, where there was a wedding, in order to increase the festivity of the entertainment, she procured drums and trumpets to entertain them. The noise of these was so much greater than what the little animals were used to, that they instantly forsook their situation, and were never heard in that mansion more.

## THE MOLE CRICKET.

THIS little creature, which is a complete representative of the mole, among the insect tribes, is, for an insect, very large, being two inches and a half in length, and three quarters of an inch in breadth. Its fore-feet are broad, and strong; and in their formation and position bear a great resemblance to the fore-feet of that animal. They are used for precisely the same purpose as those of moles, to burrow under the surface of the ground, where the insect commonly resides; and so expertly does it use them that it can penetrate the earth with even greater expedition than the mole.

The female forms a cell of clammy earth, about the size of a hen's egg, closed up on every side, and within as large as two hazel nuts. The eggs, amounting to nearly a hundred and fifty, are white, and about the size of caraway comfits: they are carefully covered, as well to defend them from the injuries of the weather as from the attacks of one of the species of black beetles, which often destroys them. The female places herself near the entrance of the nest, and, whenever the beetle attempts to seize its prey, the guardian insect catches it behind, and bites it asunder. Nothing can exceed the care of these animals in the preservation of their young. Wherever a nest is situated, fortifications, avenues, and entrenchments surround it: there are also numerous meanders which lead to it, and a ditch encompasses the whole, which few other insects are capable of passing.

These insects, at the approach of winter, remove their nest to so great a depth in the earth as to have it always lower than the frost can penetrate. When the mild season comes on, they raise it in proportion to the advances of that favourable time, and at last elevate it so near to the surface as to render it susceptible both of air and sun-shine: and if the frost return, they again sink it to its proper depth. A method very similar is practised by the ants with their nests.

Mole crickets, about the middle of April, if the weather be fine, and just at the close of day, utter a low, dull, jarring note, not much unlike the chattering of the goat-sucker. In the beginning of May they lay their eggs. Mr. White says, that a gardener, at a house where he was on a visit, happening to be mowing by the side of a canal, on the sixth of May, his scythe struck too deep, pared off a large piece of turf, and laid open to view a curious scene of domestic economy. There were many caverns and winding passages leading to a kind of chamber, neatly smoothed and rounded, and about the size of a moderate snuff-box. Within this secret nursery were deposited near a hundred eggs of a dirty yellow colour, and enveloped in a tough skin, but too lately excluded to contain any rudiments of young, being full of a viscous substance. The eggs lay but shallow, and within the influence of the sun, just under a little heap of fresh mould, like that which is raised by ants.

These are troublesome insects in hot-beds, where they make great havoc by hacking and gnawing the roots of plants with their fore-feet, the ends of which are armed with teeth like a saw.

A mole cricket was kept alive by the Rev. Mr. Gould, during several of the summer months. He fed it on the larvæ and chrysalids of ants, which it seized very greedily.

## *THE GRASSHOPPER OR FIELD CRICKET.*

THIS animal is of the colour of green leaves, except a little of brown which streaks the back, and two pale lines under the belly, and behind the legs. It may be divided into the head, the corselet, and the belly. The head is oblong, regarding the earth, and bearing some resemblance to that of a horse. Its mouth is covered by a kind of round buckler jutting over it, and armed with teeth of a brown colour, hooked at the points. Within the mouth is perceivable a large reddish tongue, fixed to the lower jaw. The feelers, or horns, are very long, tapering off to a point; and the eyes are like two black specks, a little prominent. The corselet is elevated, narrow, armed above and below, by two serrated spines. The back is armed with a strong buckler, to which the muscles of the legs are firmly bound, and round these muscles are seen the vessels by which the animal breathes, as white as snow. The last pair of legs are much longer and stronger than the first two pair, fortified by thick muscles, and very well formed for leaping. It has four wings; the anterior ones springing from the second pair of legs, the posterior from the third pair. The hinder wings are much finer, and more expansive, than the foremost, and are the principal instruments of its flight. The belly is considerably large, composed of eight rings, and terminated by a forky tail, covered with down, like the tail of a rat. See fig. 9. in the plate of insects. When examined internally, besides the gullet, we discover a small stomach; and behind that a very large one, wrinkled and furrowed within side; lower down there is still a third; so that it is not without reason, that all the animals of this order are said to chew the cud, as they so much resemble ruminant animals in their internal conformation.

Soon after the grasshopper assumes its wings, it fills the meadow with its note; which, like that among birds, is a call to courtship. The male only of this tribe is vocal: and upon examining at the base of the wings, there will be found a little hole in its body, covered with a fine transparent membrane. This is thought by Linnæus, to be the instrument it employs in singing; but others are of opinion, the sound is produced by rubbing its hinder legs against each other; however this be, the note of one male is seldom heard, but is returned by another; and the two little animals, after many mutual insults of this kind, are seen to meet and fight desperately. The female is generally the reward of victory: for, after the combat, the male seizes her with his teeth behind the neck, and thus keeps her for several hours.

Towards the latter end of autumn, the female prepares to deposit her burthen; and her body is then seen greatly distended with her eggs, which she carries to the number of an hundred and fifty. In order to make a proper lodgment in the earth for them, nature has furnished her with an instrument at her tail, somewhat resembling a two-edged sword, which she can sheath and unsheath at pleasure: with this she pierces the earth as deep as she is able; and into the hole which her instrument has made, she deposits her eggs one after the other. Having thus provided for the continuation of her posterity, the animal herself does not long survive; but as the winter approaches, she dries up, seems to feel the effects of age, and dies from a total decay. Some, however, assert, that she is killed by the cold; and others that she is eaten by worms; but certain it is, that neither the male nor female are ever seen to survive the winter. In the mean time, the eggs which have been deposited continue unaltered, either by the severity of the season or the retardation of the spring. They are of an oval figure, white, and of the consistence of horn; their size nearly equals that of a grain of anise; they are enveloped in the body within a covering, branched all over with veins and arteries; and when excluded, they crack, on being pressed between the fingers: their substance within is a whitish, viscous, and transparent fluid. Generally, about the beginning of May, every egg produces an insect, about the size of a flea; these, at first are of a whitish colour; at the end of two or three days they turn black; and soon after they become of a reddish brown. They appear, from the beginning, like grasshoppers wanting wings; and hop among the grass, as soon as excluded, with great agility.

These insects appear out of their subterraneous habitations about sun-set; but they are so shy and cautious, that it is very difficult to get a sight of them; for feeling a person's footsteps as he advances, they stop short in the midst of their song, and retire backward nimbly into their burrows, where they lurk till all suspicion of danger is over. The Rev. Mr. White, of Selborne, who attentively studied their habits and manners, at first made an attempt to dig them out with a spade, but without any great success; for either the bottom of the hole was inaccessible, from its terminating under a large stone, or else in breaking up the ground the poor creature was inadvertently squeezed to death. Out of one thus bruised, a great number of eggs were taken, which were long and narrow, of a yellow colour, and covered with a very tough skin. More gentle means were then used, and these proved successful. A pliant stalk of grass, gently insinuated into the caverns, will probe their windings to the bottom, and bring out the inhabitant; and thus the humane enquirer may gratify his curiosity without injuring the object of it.

Though these insects are furnished with long legs behind, and brawny thighs adapted for leaping, yet, when driven from their holes, they shew no activity, but crawl along in so lifeless a manner as easily to be caught; and though they are provided with the curious apparatus of wings, already described, yet they never exert them, even when there seems to be the greatest occasion. The Rev. Mr. White, however, who endeavoured to transplant a colony of these insects from his terrace to the garden, believes they made use of their wings, as they soon after recovered their former habitations. When taken into the hand, they never attempt to defend themselves. Of such herbs as grow about the mouths of their burrows, they eat indiscriminately; and never in the day-time seem to stir more than two or three inches from home. Sitting in the entrance of their caverns, they chirp all night as well as day, from the middle of the month of May to the middle of July.

If caught by one of the hinder legs, they instantly disengage themselves, by leaving the leg behind; this does not grow again, as is the case with the crab and spider species; and the loss of their leg also prevents them from flying; for being unable to spring into the air, they have not room for the expansion of their wings. If handled roughly, they will bite very fiercely; and when they fly they make a noise with their wings. They generally keep in the low lands, where the grass is luxuriant, and the ground rich and fertile; there they deposit their eggs, particularly in those cracks which are formed by the heat of the sun.

One of these crickets (as we are informed by the Rev. Mr. White) when confined in a paper cage, set in the sun, and supplied with plants moistened with water, will feed and thrive; and become so merry and loud as to render it irksome to be in the same room with it. If the plants are not wetted it will die.

## THE LOCUST.

THIS insect is about three inches long, and has two horns, or feelers, an inch in length. The head and horns are of a brownish colour; it is blue about the mouth, and also on the inside of the larger legs: the shield that covers the back is greenish; the upper side of the body brown, spotted with black, and the under side purple: the upper wings are brown, with small dusky spots, with one larger at the tips; the under wings are more transparent, and of a light brown tinctured with green, with a dark cloud of spots near the tips. See fig. 7, in the insect plate. They seldom visit Europe in such dangerous swarms, yet in some of the southern kingdoms they appear very formidable. Those which have, at intervals, visited Europe, are supposed to have come from Africa, and is called the great brown locust.

The quantity of these insects is incredible to all who have not witnessed their astonishing numbers: the whole earth is covered with them for the space of several leagues. The noise they make in browzing on the trees and herbage may be heard at a great distance, and resembles that of an army foraging in secret. One would imagine, wherever they have been seen, that fire had followed their progress. Wherever their myriads spread, the verdure of the country disappears, as if a curtain had been removed: trees and plants are stripped of their leaves, and reduced to their naked boughs and stems; so that the dreary image of winter succeeds in an instant to the rich scenery of the spring. When these clouds of locusts take their flight, to surmount any obstacle, or to traverse more rapidly a desert soil, the heavens may literally be said to be obscured by them. It is confidently asserted, that when locusts take the field, they have a leader at their head whose flight they observe, and pay a strict attention to all his motions. The inhabitants of Syria have remarked that locusts are always increased by too mild winters, and that they constantly come from the desert of Arabia. From this observation it is easy to conceive that the cold, not having been rigorous enough to destroy their eggs, they multiply suddenly; and, the herbage failing them in the immense plains of the desert, innumerable legions issue forth. When they make their first appearance on the frontiers of the cultivated country, the inhabitants attempt to drive them off, by raising large clouds of smoke; but frequently their herbs and wet straw fail them. They then dig trenches, where numbers of the insects are buried: but the most efficacious destroyers are the south and south-easterly winds, and the locust-eating thrushes.

These noxious insects, when they take to flight, seem at a distance like a dark cloud, which, as it approaches, almost excludes the light of day. It often happens that the husbandman sees them pass over without doing him any injury; but in this case they only proceed to settle on some less fortunate country. Where-ever they alight, they make dreadful havoc among the vegetation. In the tropical climates their presence is not attended with such destructive consequences as in the southern parts of Europe; for in those the vegetative power is so strong and active that an interval of only a few days will sometimes repair all the damage: but in Europe their ravages cannot be obliterated till the succeeding year. "One thing which always surprised me," says Mr. Adanson in his Voyage to Senegal, "is the amazing rapidity with which the sap of trees in this country repairs any loss they happen to sustain; and I was never more astonished than when, four days after a terrible invasion by the locusts, in which every green thing was devoured, I saw the trees covered with new leaves, and not appear to have suffered very greatly. The herbaceous plants bore marks of the devastation somewhat longer; but a few days were sufficient to repair every mischief." In their long flights to this part of the world, from the extent of their journey, they are also nearly famished, and therefore more voracious wherever they happen to alight.

Nearly as much damage, it is said, is occasioned by what they touch as by what they devour. Their bite is thought to contaminate the plants, and either to destroy or greatly to weaken their vegetation. When dead, they infect the air in such a manner that the stench is frequently insupportable. Orosius says, that in the year of the world 3800, Africa was infested with a multitude of locusts. After having eaten up every thing that was green, they flew off and were drowned in the sea; where they caused such a stench as could not have been equalled by the putrefying carcases of a hundred thousand men.

A cloud of locusts were seen to enter Russia in 1650, (some writers say 1690) in three different places; and from thence they spread themselves over Poland, and Lithuania, in such astonishing multitudes that the air was darkened, and the earth covered with their numbers. In some places, they were seen lying dead, heaped upon each other to the depth of four feet; in others they covered the surface of the ground like a black cloth: the trees bent with their weight; and the damage that the country sustained exceeded computation.

Their numbers in Barbary are often formidable; and Dr. Shaw, as he informs us in his Travels, was a witness of their devastations there in 1724. Their first appearance was in the latter end of March, when the wind had been southerly for some time. In the beginning of April their numbers were so increased, that, in the heat of the day, large swarms appeared like clouds, and darkened the sun. In the middle of

May they began to disappear, retiring into the plains to deposit their eggs. In June the young brood came forth, forming many compact bodies of several hundred yards square; which, afterwards marching forward, climbed the trees, walls, and houses, devouring every vegetable that was in their way. The inhabitants, to stop their progress, formed trenches all over their fields, and gardens, which they filled with water. Some placed large quantities of heath, stubble, and other combustible matter in rows, and set them on fire on the approach of the locusts. This, however, was all to no purpose, for the trenches were quickly filled up, and the fires put out by the immense swarms that succeeded each other. A day or two after one of these was in motion, others that were just hatched came to glean after them, gnawing off the young branches, and the very bark of the trees. Having lived near a month in this manner, they arrived at their full growth, and threw off their larva state by casting their skins. To prepare themselves for this change they fixed their hinder parts to some bush or twig, or corner of a stone; when immediately, by an undulating motion, their heads would first appear, and soon after the rest of their bodies. The whole transformation was performed in seven or eight minutes time; after which they remained for a little while in a weak state; but as soon as the sun and air had hardened their wings, and dried up the moisture that remained after casting their sloughs, they returned to their former greediness, with an addition both of strength and agility. But they did not long continue in this state before they were entirely dispersed. After laying their eggs, they directed their course northward, and probably perished in the sea.

Mr. Barrow says, that in the part of the country where he was in 1797, for an area of nearly two thousand square miles, the whole surface of the ground might literally be said to be covered with them. The water of a very wide river was scarcely visible on account of the carcases that floated on the surface, drowned in the attempt to come at the reeds that grew in it. They had devoured every blade of gras, and every green herb except the reeds. They are not, however, without a choice in their food. When they attack a field of corn just come into ear, this gentleman says, they first mount to the summit, and pick out every grain before they touch the leaves and stem. The insect seems to be constantly in motion, and always to have some object in view. When the larvæ, for these are much more voracious than the perfect insects, are on a march during the day, it is utterly impossible to turn the direction of the troop which is generally with the wind. Towards the setting of the sun the march is discontinued, when the troop divides into companies that surround the small shrubs or tufts of grass, or ant-hills, and in such thick patches that they appear like so many swarms of bees; and in this manner they rest till day-light. At these times it is that the farmers have any chance of destroying them, which they are sometimes able in a great measure to effect, by driving among them a flock of two or three thousand sheep: by the restlessness of these, great quantities of them are trampled to death. This year, (1797) was the third of their continuance in Sneuwberg; and their increase, according to Mr. Barrow's account, had far exceeded that of a geometrical progression whose ratio is a million. This district, for ten years preceding their present visit, was entirely free from them. Their former exit was somewhat singular. All the full-grown insects were driven into the sea by a tempestuous north-west wind, and were afterwards cast upon the beach, where, it is said, they formed a bank of three or four feet high that extended a distance of nearly fifty English miles; and it is asserted, that when this mass became putrid, and the wind was at south-east, the stench was sensibly felt in several parts of Sneuwberg, distant at least a hundred and fifty miles.

There is no animal in the creation which multiplies so fast as these, if the sun be warm, and the soil in which their eggs are deposited be dry. But damp climates are so contrary to their nature, that so far from encreasing they can barely exist in them. The female locust, when she lays her eggs, which are generally about forty in number, and about the size of caraway comfits, retires to some solitary place under ground; where, by her sagacity, she secures them from the intemperance of the air, as well as from the more immediate danger of the plough or spade, one fatal blow of which would destroy all the hopes of a rising generation. It is said that the holes these animals make to deposit their eggs are four feet deep in the ground, each lays about fourscore eggs, which are about the size of caraway comfits, and bundled up together in clusters.

In some parts of the world, the inhabitants turn what seems a plague to their own advantage. Locusts are eaten by the natives in many kingdoms of the east, and are caught in small nets provided for that purpose. They parch these insects over the fire in an earthen pan, and when their wings and legs are fallen off, they turn reddish, like boiled shrimps. Dampier says, he has eaten them, thus prepared, and they are a tolerable dish. The natives of Barbary also eat them fried with salt, and they are said to taste like cray-fish. Vaillant also, in his Travels into the Interior Part of Africa, in 1781, relates, that his hottentot attendants were much delighted at the appearance of a swarm of locusts, which resembled a cloud; as these insects passed over their heads they caught them in great numbers, and ate them with much avidity; from which he was induced to partake, but declares that he did not like them.

In Tonquin there is a locust about the bigness of the top of a man's finger, and as long as the first joint. It breeds in the earth, in low ground; and in the months of January and February, they issue from the earth in vast swarms. At first they can hardly fly, so that they often fall into the rivers in great numbers: however, the natives in these months watch the rivers, and take them up in multitudes in small nets. They either eat them fresh, broiled on the coals, or pickle them for keeping. They are considered as a great delicacy in that part of the world, as well by the rich as the poor. In the countries where they are eaten, they are regularly brought to market, and sold as larks or quails in Europe. They must have been a common food with the Jews, as Moses, in the book of Leviticus, permits them to eat four different kinds of this insect, which he takes care to specify.

The great West-Indian locust, individually considered, is the most formidable of this noxious tribe. It is about the thickness of a goose-quill, and the body is divided into nine or ten joints, in the whole about six or seven inches long. It has two small eyes, standing out of the head like those of crabs, and two feelers like long hair. The whole body is studded with small excrescences, which are not much bigger than the points of pins. The shape is roundish, and the body diminishes in circumference to the tail, which is forked into two horns. Between these there is a sort of sheath, containing a small dangerous sting. If any person happen to touch this insect he is sure to be stung; and is immediately seized with a shivering and trembling all over the body; which, however, may soon be put a stop to, by rubbing the place that was affected with a little palm oil.

## *THE BEETLE.*

THERE are various kinds of this insect, all, however, concurring in one common formation of having cases to their wings, two in number, which are the more necessary to those insects, as they often live under the surface of the earth, in holes which they dig out by their own industry. The cases prevent the various injuries their real wings might sustain against the sides of their abode. These, though they do not assist flight, yet, keep the internal wings clean and even, and produce a loud buzzing noise, when the animal rises in the air. Beside the difference which results from the shape and colour of these animals, the size also makes a considerable one; some beetles being not larger than the head of a pin, while others, such as the elephant beetle, are as big as one's fist: but the greatest difference among them is, that some are produced in a month, and in a single season go through all the stages of their existence, while others take near four years to their production; and live as winged insects a year more.

The burying beetle, which is an inhabitant of of the deserts of Tartary, and several other parts of the continent, is generally found there under carcases that are dried in the sun. Its shells are of an opake black colour, striated, punctured, and somewhat rough.

M. Gleditch, who had at different times, observed that moles which had been left upon the ground after they had been killed, very unaccountably disappeared, was determined to ascertain by experiment, if possible, what could be the cause of this singular occurrence. In the month of May, this gentleman accordingly obtained a dead mole, which he placed on the moist soft earth of his garden, and in two days he found it sunk to the depth of four fingers' breadth into the earth: it was in the same position in which he had placed it, and its grave corresponded exactly with the length and breadth of its body. The day following, this grave was half filled up; and he drew out the mole cautiously, which exhaled a horrible stench, and found, directly under it, little holes in which were four beetles of the above species. Discovering at this time nothing but these beetles, he put them into the hollow, and they quickly hid themselves among the earth. He then replaced the mole as he found it, and having spread a little soft earth over it, left it without looking at it again for the space of six days. In about three weeks he again took up the same carcase, which he found in the highest state of corruption, swarming with small, thick, whitish worms, that appeared to be the family of the beetles. These circumstances induced him to suppose that it was the beetles that had thus buried the mole, and that they had done this for the sake of lodging in it their offspring. Our author then took a glass cucurbit, and half filled it with moist earth; into this he put the four beetles with their young, and they immediately concealed themselves. This cucurbit, covered with a cloth, was placed on the open ground, and in the course of fifty days the four beetles interred the bodies of *four* frogs, *three* small birds, *two* grasshoppers, and *one* mole, besides the entrails of a fish, and two small pieces of the lungs of an ox.

The following is an account of the extraordinary mode in which they performed this singular operation. A linnet that had been dead six hours was placed in the middle of the cucurbit; in a few moments the beetles quitted their holes, and traversed the body. After a few hours one pair of the beetles only was seen about the bird, the largest of which was suspected to be the female. They began their work by hollowing out the earth from under the bird. They arranged a cavity the size of the bird, by pushing all around the body the earth which they removed. To succeed in these efforts, they leaned themselves strongly upon their collars, and, bending down their heads, forced out the earth around the bird like a kind of rampart. The work being finished, and the bird having fallen into the hollow, they covered it, and thus closed the grave. It appeared as if the bird moved alternately its head, its tail, its wings, or feet. Every time that any of these movements were observed, the efforts that the beetles made to draw the body into the grave, which was now nearly completed, might be remarked: in effecting this, they jointly drew it by its feathers below. This operation lasted full two hours, when the smallest or male beetle drove away the female from the grave, and would not allow her to enter the hole as often as she attempted to come out of it.

The insect continued this work alone for at least five hours; and it was astonishing to observe the great quantity of earth that he removed in that time: but our author's surprise was much augmented when he saw the little animal stiffening its collar, and exerting all its strength, lift up the bird, make it change its place, turn, and in some measure, arrange it in the grave that it had prepared; which was so spacious, and so far cleared, that he could perceive exactly under the bird all the movements and all the actions of the beetle. From time to time the beetle, coming out of its hole, mounted upon the bird, and appeared to tread it down; then, returning to the charge, it drew the bird more and more into the earth, till it was sunk to a considerable depth. The beetle, in consequence of this uninterrupted labour, appeared to be tired: leaning its head upon the earth, it continued in that position near an hour without motion; and it then retired completely under ground. Early in the morning the body was drawn entirely under ground, to the depth of two fingers breadth, in the same position that it had when laid on the earth; so that this little corpse seemed as if it were laid out on a bier, with a small mount or rampart all round for the purpose of covering it. In the evening the bird was sunk about half a finger's breadth deeper in the earth; and the operation was continued for near two days more, when the work obtained its final completion.

A single beetle was put into the glass cucurbit with the body of a mole, and covered as before, with a fine linen cloth. About seven o'clock in the morning, the beetle had drawn the head of the mole below; and in pushing the earth backward, had formed a tolerably high rampart around it. The interment was completed in this instance by four o'clock in the afternoon, a space of time so short that one could scarcely have imagined possible by so small a creature, without any assistance, considering that the body of the mole must have exceeded it in bulk and weight at least thirty times.

The interment of these animals (which generally takes place from about the middle of April to the end of October) is not merely for food, but as a proper nidus for their eggs, and to nourish the young family of grubs which they produce.

The dorr-beetle, may-bug, or cock-chafer, has, like all the rest of the tribe, a pair of cases to its wings, which are of a reddish brown colour sprinkled with a whitish dust, which easily comes off. In some their necks are covered with a red plate, and in others with a black one. The fore-legs are very short, and the better calculated for burrowing in the ground, where this insect makes its retreat. It is well known for its evening buzz to children; but still more formidably introduced to the acquaintance of husbandmen and gardeners; for in some seasons, it swarms in such numbers as to eat up every vegetable production.

The larvæ or grubs of this species, are more voracious, and more destructive to vegetation, than those of almost any of the insect tribes. The eggs are deposited in the ground by the winged insect. From each of these proceeds, after a short time, a whitish worm with six legs, a red head and strong claws, and about an inch and a half long, which is destined to live in the earth under that form for four years, and there undergo various changes of its skin, until it assumes its chrysalid form. It subsists, during its subterraneous abode, on the roots of trees and plants, committing ravages often of the most deplorable nature. These creatures, sometimes in immense numbers, work between the turf and the soil in the richest meadows, devouring the roots of the grass to that degree that the turf rises, and will roll up with almost as much ease as if it had been cut with a turfing-spade: and underneath the soil appears turned into a soft mould for about an inch in depth, like the bed of a garden. In this the grubs lie, in a curved position, on their backs, the head and tail uppermost, and the rest of the body buried in the mould At the end of four years they are about to undergo their change, dig deep into the earth, sometimes five or six feet, and there spin a smooth case, in which they change into a chrysalis. They remain under this form all winter till the month of February, when they become perfect beetles, but with their bodies quite soft and white. In May the parts are hardened, and they then come forth out of the earth. This accounts for our often finding the perfect insects in the ground.

Cock-chafers fly in the evening towards sunset, and particularly about places where there are trees. They eat the leaves of the sycamore, the lime, the beech, the willow, and those of all kinds of fruit-trees. In its winged state this insect exhibits not less voracity on the leaves of trees than it before did in its grub state in the earth; for, such is the avidity with which it devours its food, and so immense are sometimes the numbers, that, in particular districts, they do considerable damage.

We read in the Philosophical Transactions, in 1668, that cock-chafers appeared on the hedges and trees of the south-west coast of the county of Galway, in clusters of thousands, clinging to each other's backs in the manner of bees when they swarm. During the day they continued quiet, but towards sun-set the whole were in motion; and the humming noise of their wings sounded like distant drums. Their numbers were so great, that, for the space of two or three square miles, they entirely darkened the air. Persons travelling on the roads, or who were abroad in the fields, found it difficult to find their way home, as the insects were continually beating against their faces, and caused great pain. In a very short time the leaves of all the trees for some miles round were destroyed, leaving the whole country, though it was near midsummer, as naked and desolate as it would have been in the middle of winter. The noise that these enormous swarms made in seizing and devouring the leaves, was so loud as to have been compared to the distant sawing of timber. Swine and poultry destroyed them in vast numbers. These waited under the trees for the clusters dropping, and devoured such swarms as to become fat from them alone. Even the native Irish, from the insects having eaten up the whole of the produce of the ground, adopted a mode of dressing them, and used them as food. Towards the end of summer they disappeared so suddenly that in a few days there was not a single one left.

Farmers have frequently sustained much injury by these destructive insects, but happily the rooks and gulls devour immense numbers of their grubs. The sole employment of rooks, for nearly three months in the spring of the year, is to search for insects of this sort for food, and the havoc that a numerous flock makes among them must be very great.

Some farmers plough the ground in order to expose the grubs to the birds; and others take the pains to dig deeper wherever the rooks point them out by their attempts to reach them. When the insects are in their winged state, to shake the trees at noon, when they are all either asleep or in a state of inactive stupor, and gather or sweep them up from the ground, seems the most eligible method.

The green beetle or rose-chafer is the most beautiful species of beetles. The upper parts of the female are of a shining green colour, varying according to the light in which it is held, and marked transversely on the wing cases with a few short white or yellowish lines. The male is of a burnished copper colour with a greenish cast. These insects are somewhat more than an inch in length. They are to be found on flowers, particularly on those of the rose and peony;

and sometimes in ants' nests. When touched they emit a fœtid moisture, which is, probably, a mode of defence against the attacks of their enemies.

The grubs that produce these beetles, feed under ground, most commonly at the roots of trees, and never appear on the surface unless disturbed by digging, or some other accident. They are thought to be injurious to the gardener from their devouring the roots of his plants and trees. The female deposits her eggs in the middle of June. For this purpose she burrows into soft light ground, hollowing out and forming for them a proper receptacle. When the operation is over she returns to the surface, and flies off, but seldom lives more than two months afterwards. The grubs are produced in about fourteen days, and immediately seek out for food, which the parent always takes care to have near the place where she lays her eggs. As soon as they have attained sufficient strength, the young grubs separate, each burrowing a different way in search of roots. They remain four years in this state, annually changing their skin till they become of full growth, when they are of a cream colour, with brown head and feet. During winter they eat but little, if at all, and retire so deep into the ground as to avoid the effects of the frost.

At the end of the fourth year, about the month of March, the grub forms a case of earth, about the size of a walnut, somewhere near the surface, within which it changes into a chrysalis. In this state it remains till the beginning of May, when it bursts out a perfect chafer. This is at first of a light green colour, and very tender; but it soon acquires its proper hardness and strength.

Rose-chafers are called by some, the *kings of the beetles:* they are, however, as busy and active as any others of the tribe, and are generally in company, and employed with

The tumble-dung beetle or pill-chafer, is somewhat more than an inch in length, and of a dusky black colour, sometimes with a greenish hue above, and underneath of a very brilliant blue or green. The wing cases and thorax are very smooth; the former marked with several longitudinal streaks, and the latter round, and margined, having a slight groove in the middle.

This insect is found both in Europe and America, and in its manners is one of the most remarkable of the beetle tribe. It comes forth in April, and is to be seen till about September, when it disappears. Its almost constant employment, in which indeed it is indefatigable, is in the different operations necessary to continue its species. It provides a proper nidus for its eggs by forming round pellets of dung, in the middle of each of which it deposits an egg. These, in September, the insects convey to the depth of about three feet into the ground. Here they remain till the approach of spring, when the grubs burst their shell, and find their way to the surface of the earth. They are very industrious, mutually assisting each other in rolling these globular balls from the place where they made them to that of their interment, which is usually the distance of some yards, more or less. This they perform breech foremost, by raising their hind parts, and forcing along the ball with their hind feet. Two or three of them are sometimes engaged in trundling one ball, which, from meeting with impediments, on account of the unevenness of the ground, is sometimes deserted by them. It is, however, attempted by others with success, unless it happen to roll into some deep hollow or chink, where they are constrained to leave it; but they continue their work by rolling off the next ball that comes in their way. None of them seem to know their own balls, but an equal care for the whole appears to affect all the community. They form these pellets while the dung remains moist, and leave them to harden in the sun before they attempt to roll them. In their moving of them from place to place, both they and the balls may frequently be seen tumbling about over the little eminences that are in their way. They are not, however, easily discouraged; and, by repeating their attempts, usually surmount the difficulties.

These insects are said to be so exceedingly strong and active as to move about with the greatest ease, things that are many times their own weight. Dr. Brickell was supping one evening in a planter's house of North Carolina, when two of them were conveyed, without his knowledge, under the candle-sticks. A few blows were struck on the table, and to his great surprise the candlesticks began to move about, apparently without any agency; and his surprise was not much lessened when, on taking one of them up, he discovered that it was only a chafer that moved.

The musk-beetle derives its name from its musky smell. The grubs from which these beetles proceed, resemble soft, slender worms, and are provided with six hard legs. They are commonly white, and penetrate into the inner part of trees for the purpose of obtaining food, and likewise a retreat after they are transformed into nymphs. As soon as the last change is completed, the winged capricorn is seen issuing from these cavities, and may then be very easily caught. Many of these beetles emit an odour, which is perceived to a considerable distance; and when they are laid hold of produce a sound, which is supposed to be occasioned by the friction of the thorax and abdomen.

The larger musk-scented green capricorn-beetle is a very large, beautiful insect, being of a glossy, brilliant, bluish-green colour, with a cast of a shining golden yellow. The upper part of he body is blue, and the wings underneath the case are black. The legs are of the same bluish green colour, but rather paler. Each side of the breast is furnished with a sharp protuberance; between these points are three small tubercles near the wings, and three others towards the head. The cases of the wings are oblong, and have three ribs, somewhat elevated, which run lengthwise. The feelers are as long as the body, and are composed of many small joints which decrease in size towards the ends. It frequents the leaves of the willow, and has an agreeable musky smell.

The stag-beetle is so called from the singular form of its large moveable maxillæ, which resemble the horns of a stag. These instruments project from the head nearly one third of the animal's length, and are broad and flat. In the middle, towards the inner part, they have a small branch, and the ends are forked. These romantic horns are supported by a head, short, broad, and irregular; the thorax, intervening between it and the body, is narrower than either, and marginated around. The colour of the whole animal is a deep brown, its shells or cases being perfectly plain, and unadorned with either streaks or lines. The female stag-beetle is distinguished by having horns not above half as large as those of the male. They are both, however, armed on the anterior side with small teeth, through their whole length. In both the male and female the horns are sometimes as red as coral, which gives the animal a very beautiful appearance.

In some parts of this country these animals are very rare; their usual residence is the oak. Though here it grows to such a size as to be the largest of all the coleopterous insects in this part of the world, yet in countries where the climate is warmer, and the forests more extensive, the stag beetle arrives at a much greater bulk, and possesses uncommon strength and vigour. In those parts their horns become a formidable offensive weapon, and their bite is dreaded by those who have once experienced its effects.

The elephant-beetle nearly resembles the stag-beetle, and is found in South America, particularly Guiana and Surinam, as well as about the rivers Oroonoko. It is of a black colour, and the whole body is covered with a very hard shell, full as thick and as strong as that of a small crab. Its length, from the hinder part of the eyes, is almost four inches, and three quarters. The transverse diameter of the body is two inches and a quarter, and the breadth of each elytron, or case for the wings, is an inch and three-tenths. The antennæ, or feelers, are quite horny; for which reason the proboscis, or trunk, is moveable at its insertion into the head, and seems to supply the place of feelers. The horns are eight tenths of an inch long, and terminate in points. The proboscis is an inch and a quarter long, and turns upwards, making a crooked line, terminating in two horns, each of which is near a quarter of an inch long; but they are not perforated at the end like the proboscis of other insects. About four-tenths of an inch above the head, at that side next the body, is a prominence, or small horn, which, if the rest of the trunk were away, would cause this part to resemble the horn of a rhinoceros. There is indeed, a beetle so called, but then the horn, or trunk, has no fork at the end, though the lower horn resembles this. See fig 8, in the plate of insects.

The ground-beetle deposits its eggs in the earth, or in decayed trees, where the larvæ or grubs reside till their transformation. In the state of caterpillars these insects do incalculable injury to gardens. Their rapacity is not, however, confined to vegetable productions; for every insect which chance or superiority of strength places within their power, falls a victim to their tyrannic and voracious disposition.

The violet-beetle is a beautiful insect of an oblong shape, and a dark violet colour. The edges of the cases to the wings and of the thorax are violet with a shade of purple. The former are without either dots or streaks, but are marked lengthwise with deep wrinkles. This insect is most commonly found among rotten wood.

The head, antennæ, thorax, and feet, of the bombardier are of a brownish red colour. The eyes are black, and the abdomen and wing cases blue bordering on black: the latter are marked with broad but shallow striæ. This insect is sometimes found in England: it keeps itself concealed among stones, and seems to make little use of its wings. When it moves it is by a sort of jump; and, when it is touched, we are surprised with a noise resembling the discharge of a musket in miniature, during which a blue smoke may be perceived to proceed from its extremity. The insect may at any time be made to play off its artillery by scratching its back with a needle. Rolander (who first made these observations) says, it can give twenty discharges successively. A bladder, placed near its posterior extremity, is the arsenal that contains its store. This is its chief defence against its enemies; and the vapour or liquid that proceeds from it is of so pungent a nature, that, if it happen to be discharged into the eyes, it makes them smart as though brandy had been thrown into them.

There is another insect of this tribe, but three or four times its size, which is the bombardier's principal enemy. When pursued and fatigued, the bombardier lies down in the path of his adversary, who advances with open mouth to seize him; but on the discharge of the artillery the enemy suddenly draws back, and remains for a while confused, during which the bombardier conceals himself in some neighbouring crevice; but, if not lucky enough to find one, the other returns to the attack, takes the insect by the head, and tears it off.

## *THE GLOW-WORM.*

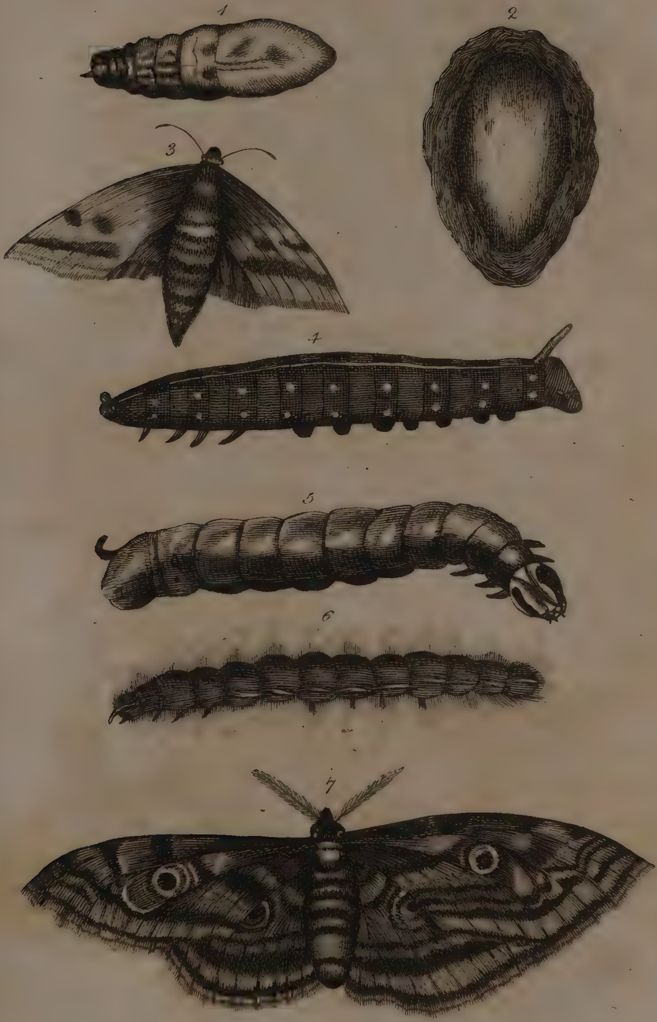
THE female is (which is unusual in animals) larger than the male glow-worm: their heads are of the same shape, and equally concealed by the plate of the thorax. The principal difference between the sexes is that the abdomen of the male is covered with brown wing cases, shagreened, and marked longitudinally with two lines: these are longer than the abdomen. The female is wingless. Each sex is luminous, but in the male the light is less brilliant, and confined to four points, two of which are situated on each of the two last rings of the abdomen. Among the crooked lanes, in every hedge, the glow-worm lights his gem, and, through the dark, a moving radiance twinkles.

These insects are frequently met with towards evening in the month of June, in woods and meadows, and the bottoms of hedges. The utility of the bright light of the females is supposed to consist in attracting the attention of the males during the dark, when, alone, they are able to render themselves conspicuous. They always become much more lucid when they put themselves in motion. This would seem to indicate that their light is owing to their respiration; in which process, it is probable, phosphoric acid is produced by the combination of oxygen gas with some part of the blood, and that a light is given out through their transparent bodies by this slow internal combustion. By contracting themselves, the insects have a power of entirely withdrawing it: when they are at rest very little light is to be seen. Mr. Templer, who made many observations on these insects, says that he never saw a glow-worm exhibit its light at all, without some sensible motion either in its body or legs. This gentleman, when the light was most brilliant, fancied it emitted a sensible heat.

If the insect be crushed, and the hands or face are rubbed with it, they contract a luminous appearance similar to that produced from phosphorus. When a glow-worm is put into a phial, and the phial is immersed in water, a very beautiful irradiation will take place.

## *THE EARWIG.*

THE antennæ of this tribe are bristle-shaped, and the feelers unequal and thread-shaped. This insect, though it may not be suspected by the generality of observers, is possessed of wings which are both large and elegant, and one of these, when extended, will nearly cover the



SILK-WORM AND BUTTERFLY.

Pub. May 1, 1806, by James Cundee London.

whole insect. The elytra, or wing cases, are short, and extend not along the whole body but only over the breast. The wings are concealed beneath these; they are somewhat of an oval shape, and, when extended, nine or ten times as large as the elytra. There is a great degree of elegance in the manner in which the insect folds them beneath. They are first closed up lengthways from a centre close to the body like a fan, and afterwards refolded across in two different places, one about the middle of the membrane, and the other at the centre, from whence the first folds proceeded. By this means the wing is reduced into a small compass, and proportioned to the size of the case under which it is to lie.

The common earwig is easily distinguishable from all the beetles by the forceps or pincers at the end of its tail. It is produced from an egg, and the larva differs very little in its external appearance from the complete insect, except that it has neither wings nor elytra, and that the breast and thorax are not distinguishable. In this state it is a very lively little animal, running about with great agility, even from the instant it leaves the egg. On its metamorphosis to a perfect insect, a part of its body bursts behind, and gives full play to the wings.

It is a circumstance extremely singular, that, unlike those of most others of the insect tribe, the eggs are hatched, and the young earwigs fostered by the parent. M. de Geer found under a stone a female earwig, accompanied by many little insects, which evidently appeared to be her own young. They continued close to her and often placed themselves under her belly as chickens do under a hen. He put the whole into a box of fresh earth: they did not enter the earth, but it was pleasing to observe how they thrust themselves under the belly, and between the legs of the mother, who remained very quiet, and suffered them to continue there sometimes for an hour or two together. To feed them, this gentleman gave them a piece of a very ripe apple; in an instant the old one ran upon it, and ate with a good appetite; the young ones also seemed to eat a little, but apparently with much less relish. In a week's time he remarked that the young earwigs had changed their skins, and he found also the sloughs that they had quitted. This moulting produced only a slight change in their figure, yet it evidently brought them nearer to the perfect insect.

The same gentleman found, at another time, a female earwig under some stones, placed over a heap of eggs, of which she took all the care imaginable without ever forsaking them. He took both the female and her eggs, placed her in a box half filled with fresh earth, and dispersed the eggs up and down in it. She however, soon removed them, one after another, carrying them between her jaws, and, at the end of a few days, he saw that she had collected them all into one place upon the surface of the earth, and remained constantly on the heap, without quitting it for a moment, so that she seemed truly to sit for the purpose of hatching her eggs. The young were produced in about five weeks: in figure they were similar to those before mentioned, but at their birth they were all white except towards the tail, where a yellow matter was observable through the skin, and the eyes and teeth, which were reddish. He kept them in the box with their mother, feeding them from time to time with bits of apple, and saw them grow every day, and change their skins more than once. The mother died, and her progeny devoured nearly the whole of her body. The little ones that died underwent also the same fate: M. de Geer, however, conjectures that this took place only from want of other food, as he had neglected to supply them regularly with nutriment. In two months time, one only remained alive; it was full grown, and then in the nymph or pupa state.

This insect does great damage to gardens. It lives among flowers, and frequently destroys them; and, when fruit has been wounded by flies, the earwigs also generally come in for a share. In the night they may often be seen in amazing numbers upon lettuces and other esculent vegetables, committing those depredations that are often ascribed to snails or slugs. The best mode, therefore of destroying them seems to be to attend the garden now and then in the night, and to seize them while they are feeding. The usual mode of catching them is by sticking the bowl of a tobacco-pipe, and the claws of lobsters upon sticks that support flowers, as, in the day-time, they creep into holes and dark places. Placing hollow reeds behind the twigs of wall-trees is also a good mode, if they be examined and cleared every morning.

This insect has been supposed capable of introducing itself into the ear, and from thence penetrating into the brain, and occasioning death. This is looked upon as an idle notion by the Rev. Mr. Bingley; any insect, however, a fly, flea, &c. may, by chance, enter the ear, but will also be desirous of getting out again: thus, if a person be lying down in a field, garden, &c. an earwig may likewise go into the ear and become troublesome. Such circumstance has happened to the editor's knowledge, but was not productive of any ill consequence.

## *THE DEATH-WATCH, OR PTINUS,*

IS a dusky or somewhat hairy insect, with irregular brownish spots, about a quarter of an inch in length. Notwithstanding its smallness, this creature is often the cause of serious alarm among the lower class of people, from the noise that it makes, at a certain time of the year, resembling the ticking of a watch. From this it has its name, for, whenever this faculty is exerted, it is esteemed portentive of death to some one of the family in the house where it is heard. It is chiefly in the advanced state of spring that these insects commence their noise, which is no more than a call or signal by which they are mutually attracted to each other; and it may be considered as analogous to the call of birds. This noise does not arise from the voice, but from the insects beating on any hard substance with the shield or fore-part of the head. The general number of successive distinct strokes is from seven to nine, or eleven. These are given in pretty quick succession, and are repeated at uncertain intervals; and in old houses, where the insects are numerous, they may be heard, if the weather be warm, almost every hour in the day. The noise exactly resembles that made by beating with the nail on a table. The insect being difficult to discover, from its obscure greyish brown colour, nearly resembling that of decayed wood, it is not always easy to say from what exact spot the sound proceeds.

Mr. Stackhouse, as we read in the Phil. Trans. Vol. 33. observed carefully the manner of its beating. He says the insect raises itself on its hinder legs, and, with the body somewhat inclined, beats its head with great force and agility against the place on which it stands. One of them, on a sedge-bottomed chair, exerted so much force that its strokes were impressed and visible in the exterior coat of the sedge, for a space equal to that of a silver penny. Mr. Stackhouse took this insect and put it into a box. On the following day he opened the box, and set it in the sun. It seemed very brisk, and crept about with great activity on the bits of sedge and rotten wood, till at last, getting to the end of the pieces, it extended its wings, and was about to take leave; he shut down the lid, when it withdrew them and remained quiet. He kept it by him about a fortnight.

Strange as it may appear, this little animal is capable of being tamed. Dr. Derham kept a male and female together in a box for about three weeks; and, by imitating their noise (beating with his nail, or the point of a pen, on a table or board), he made them beat whenever he pleased, and they not only answered very readily, but even continued their beatings as long as required. At the end of this time one of them died, soon after which the other gnawed its way out and escaped.

## *THE DEATH-WATCH TERMES.*

THIS insect, which is sometimes mistaken for the ptinus just mentioned, is of a very different tribe, and about a tenth of an inch long. At first sight it has greatly the appearance of a louse: its mouth, however, with a glass is seen to be reddish, and its eyes are yellow. The antennæ are sharply pointed and somewhat long. It is sometimes, though very rarely, observed to have wings.

This insect, is usually found in old wood, decayed furniture, museums and neglected books; and both the male and female have the power of making a ticking noise, not unlike that of a watch, to attract each other. The female lays her eggs in dry and dusty places, where they are likely to meet with the least disturbance: these are exceedingly small, and are not unlike the nits or eggs of lice. They are generally hatched about the beginning of March, or a little sooner or later according to the weather. After leaving the egg, the animals are so small as scarcely to be discerned without the assistance of a glass. They continue in this larva state, somewhat resembling in appearance the mites in cheese, about two months; after which they undergo their change. They feed on dead flies and other insects; and from their numbers and voracity, often very much deface cabinets of natural history. They also live on various other substances, and may frequently be observed hunting for nutritious particles with great care and attention, among the dust in which they are found: turning it over with their heads, and searching among it somewhat in the manner of swine. Many of them live through the winter; but during that time, in order to avoid the inconveniences of frost, they bury themselves deep in dust.

These little animals are in considerable numbers during the summer months; but, when disturbed, they run so nimbly into a hiding-place as not often to be remarked. When they are disturbed, they are very shy in making their tickings; but if they can be viewed without being alarmed by noise, or moving the place where they are, they will not only beat freely but even answer any person's beating with his nail. At every stroke their body shakes, or seems affected as by a sudden jerk; and these jerks succeed each other so quickly that it requires great steadiness to perceive with the naked eye that the body has any motion. They are scarcely ever heard to beat before July, and never later than the sixteenth of August. It appears strange that so small an animal should be able to make a noise so loud as is frequently to be heard from this; sometimes equal to that of the strongest beating watch. Dr. Derham, who examined and first described this species, says, he had often heard the noise, and in pursuing it had found nothing but these insects, which he supposed incapable of producing it; but one day, by finding that the noise proceeded from a piece of paper loosely folded and lying in a good light in his study window, he viewed it through, and with a microscope observed, to his great astonishment, one of them in the very act of beating. In some years they are more numerous than in others, and their ticking is of course more frequently heard: we are informed by the above naturalist, that, during the month of July, in one particular summer, they scarcely ever ceased, either in the day or night.

## CHAP. VII.

> "Go to the *ant*, thou sluggard, consider her ways and be wise—which, having no guide, overseer, or ruler, provideth her meat in the summer, and gathereth her food in the harvest."
>
> PROVERBS, ch. vi.

### *THE ANT.*

THE common ants of Europe are of two or three sorts; some red, some black, some with stings, and others without. Such as have stings, inflict their wounds in the usual manner; such as are unprovided with these weapons of defence, have a power of spurting, from their hinder parts, an acid pungent liquor, which if it light upon the skin, inflames and burns it like nettles.

The body of this insect is divided into the head, breast, and belly. In the head the eyes are placed, which are entirely black, and under the eyes there are two small horns, or feelers, composed of twelve joints, all covered with a fine silky hair. The mouth is furnished with two crooked jaws, which project outwards, in each of which are seen incisors, that look like teeth. The breast is covered with a fine silky hair, from which project six legs, that are pretty strong and hairy, the extremities of each armed with two small claws, which the animal uses in climbing. The belly is more red than the rest of the body, which is of a brown chesnut colour, shining as glass, and covered with extremely fine hair. From such a formation, this animal seems bolder, and more active, for its size, than any other of the insect tribe, and fears not to attack a creature above ten times its own magnitude.

Ants are gregarious, and consist of males, females, and neuters, of which the latter are alone the labourers. These build in the ground an oblong nest, in which there are various passages and apartments. In the formation of this nest every individual is occupied: some are employed in securing a firm and durable ground-work, by mixing the earth with a sort of glue produced in their bodies: others collect little bits of twigs to serve as rafters, which they place over their passages, to support the covering: others again lay pieces across these, and place on them rushes, weeds, and dried grass. The latter they secure so firmly as completely to turn off the water from their magazines.

These little creatures, in collecting their stores, may often be observed in full employment, one of them loaded with a grain of wheat, another with a dead fly, and several together hauling along the body of some larger insect. Whenever they meet with any food too large to admit of being dragged away, they devour so much of it upon the spot as to reduce it to a bulk sufficiently small for them to carry. In all their excursions they have some object in view; and they very seldom return to the nest without either themselves bearing something, or without news that something of use has been discovered, in which joint assistance is necessary. If information be brought that a piece of sugar, or bread, or any kind of fruit, has been discovered, even in the highest story of a house, they range themselves in a line, and follow their leader to the spot.

Dr. Franklin believing that these little creatures had some means of communicating their thoughts or desires to one another, tried several experiments with them, all of which tended to confirm his opinion; but one seemed more conclusive than the rest. He put a little earthern pot, containing some treacle, into a closet, into which a number of ants collected, and devoured the treacle very quietly. But, on observing this, he shook them out, and tied the pot with a thin string to a nail which he had fastened into the ceiling; so that it hung down by the string. A single ant, by chance remained in the pot: this ant ate till it was satisfied; but when it wanted to get off, it could not, for some time, find a way out. It ran about the bottom of the pot, but in vain: it last it found, after many attempts, the way to the ceiling, by going along the string. After it was come there, it ran to the wall, and from thence to the ground. It had scarcely been away half an hour when a great swarm of ants came out, got up to the ceiling, and crept along the string into the pot, and began to eat again. This they continued till the treacle was all eaten; in the mean time one swarm running down the string, and the other up.

Ants generally lay up a considerable quantity of different kinds of grain; but, to prevent this from taking root from the moisture of their cells, they instinctively bite off that end from which the blade is produced.

The larvæ (a small kind of maggots without legs) come from their eggs, which soon transform into white chrysalids. The latter are generally called ants' eggs, and are frequently used for the feeding of young pheasants, partridges, and nightingales. When a nest is disturbed, the ants, with great care, collect all the young that are unhurt, and form a nest for them again. In their confusion they carry off the eggs and larvæ indiscriminately; but, as soon as quietness is restored among them, these are carefully separated, and each kind lodged in its own appropriate place.

Every morning during the warm season of the year they bring up the maggots nearly to the surface: so that, from ten in the morning to about five in the afternoon, these may always be found lodged just under the surface of the ground. And if their hills be examined towards eight in the evening they will be found to have carried them all down; but if rainy weather be near, it will even be necessary to dig a foot or two deeper than usual to find them.

In the last metamorphosis, the little creature tears its transparent veil, and then bursts into life a perfect insect, destitute of wings if a neuter, and winged if a female. The winged insects are also known by a small erect scale placed on the thread which connects the body and thorax. The males are much smaller than the females, and seldom frequent the common habitation. All the labour the females undergo is in the laying of eggs; and the cold of the winter season always destroys them. The neuters, or labouring ants, (which alone are able to struggle through the cold months) pass these in a torpid state, in which they remain till spring restores to them their wonted activity. They, therefore, having no consumption for provisions, lay up no stores for winter. The females and neuters are armed with a sting. The males, besides being smaller than the females, are to be distinguished from these by the largeness of their eyes.

The neuters pay the utmost attention to the females. We are informed by Mr. Gould, in his Treatise on English Ants, that he placed a female which he calls a queen, of the small black ants, in a box, in the sliding cover of which there was an opening sufficient for the labourers to pass backwards and forwards, but so narrow as to confine the queen. One part of them was constantly in waiting and surrounded her, whilst others went out in search of provisions. By some misfortune she died. The ants, as if not apprised of her death continued their obedience. They even removed her from one part of the box to another, and treated her with the same formality as if she had been alive. This lasted about two months; at the end of which the cover being opened, they forsook the box, and carried her off.

These insects frequently swarm on trees, where they have been supposed to do much injury. In Switzerland, however, they are looked upon as very serviceable, and are there compelled to remain in the trees, in order to destroy the caterpillars. This is done by hanging a pouch full of ants upon a tree, the root of which is smeared with wet clay or pitch to prevent their escape: in consequence of this, they are soon compelled by hunger to seize upon the caterpillars and devour them.

A very grateful acid is said to be obtained from ants by distillation. Mr. Consett, while walking with a young gentleman in a wood near Gottenburg in Sweden, observed a person sit down on an ant-hill, and with a great degree of pleasure devour these insects, first nipping off their heads and wings. The flavour, according to his account, was an acid somewhat resembling, though much more agreeable than that of a lemon.

The African ants are said never to be torpid; but that they build their nests with a dexterity, lay up provisions, and submit to regulations entirely unknown among those of Europe. They are in every respect a much more formidable race, and are of three kinds, red, green, and black. Their stings produce insupportable pain, and their depredations do infinite mischief. Sheep, hens, and even rats, by loitering too near their habitations, are often destroyed by them.

The great black ant of South America, stings or bites almost as bad as a scorpion; and next to this the small yellow ant's bite is most painful: for their sting is like a spark of fire; and they are so thick among the boughs in some places that one shall be covered with them before he is aware. These creatures have nests on great trees, placed on the body between the limbs; some of their nests are as big as a hogshead. This is their winter habitation; for in the wet season they all repair to these their cities, where they preserve their eggs. In the dry season, when they leave their nests, they swarm all over the woodlands; for they never trouble the savannahs: great paths, three or four inches broad, made by them, may be seen in the woods. They go out light, but bring home heavy loads on their backs, all of the same substance, and equal in size.

There are three different kinds of ants that were observed in New South Wales. Some as green as a leaf, which live upon trees, where they build their nests of various sizes, between that of a man's head and his fist. These nests are of a very curious structure: they are formed by bending down several of the leaves, each of which is as broad as a man's hand, and glueing the points of them together, so as to form a purse. The viscous matter used for this purpose is an animal juice which nature has enabled them to elaborate.

The second sort are quite black, and their operations and manner of life are not less extraordinary. Their habitations are the inside of the branches of a tree, which they contrive to excavate by working out the pith almost to the extremity of the slenderest twig; the tree at the same time flourishing as if it had no such inmate. These have malignant stings.

The third kind was found nested in the root of a plant, which grows on the bark of trees in the manner of misletoe. This root is commonly as big as a large turnip, and sometimes much bigger. Though filled with these animals, the vegetation of the plant did not appear to have suffered any injury. The animals themselves are very small, not more than half as big as the common red ant in England. They have stings, but scarcely force enough to make them felt: they have, however, a power of tormenting in an equal if not in a greater degree; for the moment the root in which they are lodged should be handled they swarm from innumerable holes, and, running about those parts of the body that are uncovered, produce a titillation more intolerable than pain, except it is increased to great violence.

The sugar ants, (which took their name from their ruinous effects on the sugar-cane) first made their appearance in Grenada about forty years ago, on a sugar plantation at Petit Havre, a bay five or six miles from the town of St. George. From thence they continued to extend themselves on all sides, for several years; destroying in succession every sugar-plantation between St. George's and St. John's, a space of about twelve miles. At the same time colonies of them began to be observed in other parts of the island. These ants are of a middle size, and of a dark red colour. They make their nests only under the roofs of particular plants and trees, such as the sugar cane, the lime, lemon, and orange trees, where they are protected from the winds and rain; and the mischief done by them does not arise from their devouring those plants, but from these lodgments at their roots. Thus the roots of the sugar cane are somehow or other injured by them as to be incapable of supplying due nourishment to the plants, which, therefore, become sickly and stunted, and consequently do not afford juices fit for making sugar, either in any quantity or of any tolerable quality. They are also injurious to several other kinds of trees, the lime, lemon, orange, &c.

The planters having in vain endeavoured to put a stop to the ravages of these insects, an act was passed by the legislature, by which the discoverer of any practical method of destroying them, so as to permit the cultivation of the sugar cane as formerly, was entitled to twenty thousand pounds, to be paid from the public treasury of the island. Many were the candidates on this occasion, but very far were any of them from having any just claim. Considerable sums of money were, however, granted in consideration of trouble and expences in making experiments. Their destruction was attempted chiefly by poison, and the application of fire. Corrosive sublimate and arsenic, mixed with animal substances, were greedily devoured by them. Myriads were thus destroyed, and the more, as they were by these applications rendered so furious as to destroy each other; yet it was found that these poisons could not be laid in sufficient quantities even to give the hundred-thousandth part of them a taste. The use of fire was attended with greater success. When wood was burnt to the state of charcoal, without flame, and immediately taken from the fire, and laid in their way, they crowded to it in such astonishing numbers as soon to extinguish it, although with the destruction of thousands. Holes were therefore dug at proper distances, and a fire made in each of them. Nevertheless the ants appeared again as numerous as ever.

At length, this calamity, which resisted so long the efforts of the planters, was removed by another, the hurricane in 1780, which, however ruinous to the other islands in the West Indies, and in other respects, was to Grenada a very great blessing. Without this it is probable that the cultivation of the sugar cane in the most valuable parts of that island must have, if not entirely, been at least, for some time, neglected.

The white ants are found in the East Indies, and in many parts of Africa, and South America, where their depredations are greatly dreaded by the inhabitants. Mr. Smeathman (Philosophical Transactions) says, that they are naturally divided into three orders: 1, The working insects, which he distinguishes by the name of labourers; 2, The fighters or soldiers, which perform no other labour than such as is necessary in defence of the nests; and, 3, The winged or perfect insects, which are male and female, and capable of multiplying the species. These last he calls the nobility or gentry; because they neither labour nor fight.

" In their nest or hill, for they build on the surface of the ground, the labourers are always the most numerous. There are at least a hundred labourers to one of the fighting insects or soldiers. When in this state, they are about a fourth of an inch in length; which is rather smaller than some of our ants.

" The second order, or soldiers, differ in figure from the labourers. These appear to be such insects as have undergone one change toward their perfect state. They are now near half an inch in length, and equal in size to about fifteen of the labourers. The form of the head is likewise greatly changed. In the labourer state, the mouth is evidently formed for gnawing, or for holding bodies; but, in the soldier state, the jaws, being shaped like two sharp awls a little jagged, are destined solely for piercing or wounding. For these purposes they are well calculated, being as hard as a crab's claw, and placed in a strong horny head, which is larger than the rest of the body.

" The insect of the third order, or in its perfect state, is still more remarkable. The head, the thorax, and the abdomen, differ almost entirely from the same parts in the labourers and soldiers. The animals are besides now furnished with four large brownish transparent wings, by which they are enabled, at the proper season, to emigrate, and to establish new settlements. They are now also greatly altered in their size as well as figure, and have acquired the powers of propagating the species. Their bodies now measure near three quarters of an inch in length, their wings, from tip to tip, above two inches and a half, and their bulk is equal to that of thirty labourers, or two soldiers. Instead of active, industrious, and rapacious little animals, when they arrive at their perfect state, they become innocent, helpless, and dastardly. Their numbers are great, but their enemies are still more numerous: they are devoured by birds, by every species of ants, by carnivorous reptiles, and even by the inhabitants of many parts of Africa. After such devastation it seems surprising that even a single pair should escape. Some, however, are so fortunate, and being found by some of the labouring insects, that are continually running about the surface of the ground under their covered galleries, are elected kings and queens of new states; all those which are not so elected and preserved, certainly perish. The manner in which these labourers protect the happy pair from their innumerable enemies, not only on the day of the massacre of almost all their race, but for a long time after, will, (contitinues Mr. Smeathman) justify me in the use of the term election. The little industrious creatures immediately inclose them in a small chamber of clay suitable to their size, into which at first they have but one entrance, large enough for themselves and the soldiers to go in and out at, but much too little for either of the royal pair to use; and, when necessity obliges them to make more entrances, they are never larger; so that, of course, the voluntary subjects charge themselves with the task of providing for the offspring of their sovereigns, as well as of working and fighting for them, until they have raised a progeny capable at least of dividing the task with them."

A most extraordinary change takes place about this time, in the queen. The abdomen begins to extend and enlarge to such an enormous size, that an old queen will sometimes have it so much increased as to be near two thousand times the bulk of the rest of her body. The skin between the segments of the abdomen extends in every direction; and at last the segments are removed to the distance of half an inch from each other, though at first the whole length of the abdomen was not half an inch. When the insect is upward of two years old, the abdomen is increased to three inches in length, and it is sometimes seen near twice that size. It is now of an irregular oblong shape, and is become one vast matrix full of eggs, which make long circumvolutions through an innumerable quantity of very minute vessels, that circulate round the inside in a serpentine manner. When the eggs are perfectly formed, they begin to be protruded, and they come forth so quickly that about sixty in a minute, or upward of eighty thousand in twenty-four hours, are deposited. These eggs are immediately taken away by the attendants, and carried to the nurseries. Here they are hatched. The young are attended and provided with every thing necessary, until they are able to shift for themselves, and take their share in the labours of the community.

The ant-hills, as their nests are called, for they are often elevated ten or twelve feet above the surface of the ground, are nearly of a conical shape; and sometimes so numerous as at a little distance to appear like villages of the negroes. We are assured by Jobson, in his History of Gambia," that some of them are twenty feet high, and that he and his companions have often hidden themselves behind them, to shoot deer and other wild animals. Each hill is composed of an exterior and an interior part. The exterior cover is a large clay shell, shaped like a dome, of strength and magnitude sufficient to inclose and protect the interior building from the injuries of the weather, and to defend its numerous inhabitants from the attacks of natural or accidental enemies. These hills make their first appearance in the form of conical turrets about a foot high. In a short time the insects erect, at a little distance, other turrets, and go on increasing their number and widening their bases, till their underworks are entirely covered with these turrets, which the animals always raise highest in the middle of the hill; and, by filling up the intervals between each, they collect them, at last, into one great dome.

The royal chamber, as Mr. Smeathman calls it, is always situated as near the centre of the building as possible, and is generally on a level with the common surface of the ground. It is nearly in the shape of half an egg, or an obtuse oval, within, and may be supposed to represent a long oven. In the infant state of the colony, it is not above an inch in length; but in time it becomes increased to six or eight inches, or more, being always in proportion to the size of the queen, who, increasing in bulk as in age, at length requires a chamber of such dimensions.

As the entrances into this royal chamber admit no animals larger than the labourers or soldiers, of course the king and queen can never possibly get out. This chamber is surrounded by an innumerable quantity of others, of different sizes, figures, and dimensions; all of them arched either in a circular or an elliptical form. These chambers either open into each other, or have communicating passages; which being always clear, are evidently intended for the convenience of the soldiers and attendants, of whom great numbers are necessary. The latter apartments are joined by the magazines and nurseries.

The magazines (so called by Mr. Smeathman, but which are no more than cavities) are chambers of clay, and are at all times well stored with provisions, which, to the naked eye, seem to consist of the raspings of wood and plants; but, when examined by the microscope, they are found to consist chiefly of the gums or inspissated juices of plants, thrown together in small irregular masses. Of these masses, some are finer than others, and resemble the sugar about preserved fruits; others resemble the tears of gum, one being quite transparent, another like amber, a third brown, and a fourth perfectly opaque.

The nurseries are always intermixed with the magazines, and are buildings totally different from the rest of the apartment. These are composed entirely of wooden materials, which seem to be cemented with gums. They are invariably occupied by the eggs, and the young which first appear in the shape of labourers. These buildings are exceedingly compact, and are divided into a number of small irregular-shaped chambers, not one of which is half an inch wide. They are placed all round, and as near as possible to the royal apartments. When a nest is in an infant state, the nurseries are close to the royal apartment. But, as in process of time the body of the queen enlarges, it becomes necessary for her accommodation, to augment the dimensions of her chamber. She then, likewise, lays a greater number of eggs, and requires more attendants; of course, it is necessary that both the number and dimensions of the adjacent apartments should be augmented. For this purpose, the small first built nurseries are taken to pieces, rebuilt a little farther off, and made a size larger, and their number, at the same time is increased. Thus the animals are continually employed in pulling down, repairing, or rebuilding their apartments; and these operations they perform with wonderful sagacity, regularity, and foresight. The nurseries are inclosed in chambers of clay, like those which contain the provisions; but they are much larger. In the early state of the nest, they are not bigger than a hazel nut, but, in great hills, they are often four or five inches across.

The royal chamber is surrounded on all sides, both above and below, by the royal apartments, (so called by our author) which contain only labourers and soldiers, that can be intended for no other purpose than to continue in the nest either to guard or serve their common parents, on whose safety the happiness, and probably the existence, of the whole community depend. These apartments compose an intricate labyrinth, which extends a foot or more in diameter from the royal chamber on every side. Here the nurseries and magazines of provisions begin; and, being separated by small empty chambers and galleries, which surround them, and communicate with each other, are continued on all sides to the outward shell, and reach up within two thirds or three fourths of its height, leaving an open area in the middle under the dome, which resembles the nave of an old gothic cathedral. This area is surrounded by large gothic arches, which are sometimes two or three feet high next to the front of the area, but diminish rapidly as they recede, like the arches of aisles in perspectives, and are soon lost among the innumerable chambers, and nurseries behind them. All these chambers and passages are arched, and contribute naturally to support one another. The inferior building, or assemblage of nurseries, chambers, and passages, has a flattish roof without any perforation. By this contrivance, if, by accident, water should penetrate the external dome, the apartments below are preserved from injury. The area has also a flattish floor, which is situated above the royal chamber. It is likewise water-proof, and so constructed that, if water get admittance, it runs off by subterraneous passages, which are cylindrical, and some of them so much as even thirteen inches in diameter. These subterraneous passages are thickly lined with the same kind of clay of which the hill is composed: they ascend the internal part of the external shell in a spiral form, and, winding round the whole building up to the top, intersect and communicate with each other at different heights. From every part of these large galleries a number of pipes, or smaller galleries, leading to different apartments of the building, proceed. There are likewise a great many which lead downward, by sloping descents, three and four feet perpendicular under ground, among the gravel, from which the labouring ants select the finer parts; which, after being worked up in their mouths to the consistence of mortar, become that solid clay or stone, of which their hills, and every apartment of their buildings, except the nurseries, are composed. Other galleries ascend and lead out horizontally on every side, and are carried under ground, but near the surface, to great distances, for the purpose of foraging.

As soon as a breach is made in one of the walls by an ax, or other instrument, the first object that attracts attention is the behaviour of the soldiers or fighting insects. Immediately after the blow is given, a soldier comes out, walks about the breach, and seems to examine the nature of the enemy, or the cause of the attack. He then gets into the hill, gives the alarm, and, in a short time, large bodies rush out as fast as the breach will permit. It is not easy to describe the fury that actuates these fighting insects. In their eagerness to repel the enemy, they frequently tumble down the sides of the hill, but recover themselves very quickly, and bite every thing they encounter. This biting, joined to the striking of their forceps upon the building, makes a crackling or vibrating noise, which is somewhat shriller and quicker than the ticking of a watch, and may be heard at the distance of several feet. While the attack proceeds, they are in the most violent bustle and agitation. If they get hold of any part of a man's body, they instantly make a wound which gives some pain. When they attack the leg the stain of blood upon the stocking extends more than an inch in width. They make their hooked jaws meet at the first stroke, and never quit their hold, but will suffer themselves to be pulled away piece after piece, without any attempt to escape. On the other hand, if a person keep out of their reach, and give them no farther disturbance, in less than half an hour they retire into the nest, as if they supposed the monster that damaged their cattle had fled. Before the whole of the soldiers have got in, the labouring insects are all in motion, and hasten towards the breach, each of them having a quantity of tempered mortar in his mouth. This mortar they stick upon the breach as fast as they arrive, and perform the operation with so much dispatch and facility, that, notwithstanding the immensity of their numbers, they never stop or embarrass one another. During this scene of apparent hurry and confusion, the spectator is agreeably surprised when he perceives a regular wall gradually rising and filling up the chasm. While the labourers are thus employed, almost all the soldiers remain within, except here and there one, who saunters about among six hundred or a thousand labourers, but never touches the mortar. One soldier, however, always takes his station close to the wall that the labourers are building. This soldier turns himself leisurely on all sides, and, at intervals of a minute or two, raises his head, beats upon the building with his forceps, and makes the vibrating noise before mentioned. A loud hiss instantly issues from the inside of the dome, and all the subterraneous caverns and passages. That this hiss proceeds from the labourers is apparent; for, at every signal of this kind, they work with redoubled quickness and alacrity. A renewal of the attack, however, instantly changes the scene. On the first stroke, the labourers run into the many pipes and galleries with which the building is perforated, which they do so quickly that they seem to vanish; for, in a few seconds, all are gone, and the soldiers rush out as numerous and as vindictive as before. On finding no enemy, they return again leisurely into the hill; and, very soon after, the labourers appear loaded as at first, as active, and as sedulous, with soldiers here and there among them, who act just in the same manner, one or other of them giving the signal to hasten the business. Thus the pleasure of seeing them come out to fight or to work alternately, may be obtained as often as curiosity excites, or time permits; and it will certainly be found that the one order never attempts to fight, nor the other to work, let the emergency be ever so great.

The task of exploring the interior parts of a nest or hill, would be attended with much difficulty; for the apartments which surround the royal chamber and the nurseries, and, indeed, the whole fabric, have such a dependence on each other, that the breaking of one arch generally pulls down two or three. Add to which the great obstinacy of the soldiers, who fight to the very last, disputing every inch of ground so well as often to drive away the negroes who are without shoes, and make white people bleed plentifully through their stockings. Neither can a building be let to stand so as to get a view of the interior parts without interruption; for, while the soldiers are defending the outworks, the labourers keep barricading all the way against intruders, stopping up the different galleries and passages which lead to the various apartments, particularly the royal chamber, all the entrances to which they fill up so artfully as not to let it be distinguishable while it remains moist; and, externally, it has no other appearance than that of a shapeless lump of clay. It is however easily found, from its situation with respect to the other parts of the building, and by the crowds of labourers and soldiers which surround it, who show their loyalty and fidelity by dying under its walls. The royal chamber, in a large nest, is capacious enough to hold many hundreds of the attendants, besides the royal pair; and it is always found as full of them as it can hold. These faithful subjects never abandon their charge even in the last distress; for, whenever our author took out the royal chamber (as he often did, and preserved it for some time in a large glass bowl) all the attendants continued running in one direction round the king and queen with the utmost solicitude, some of them stopping at the head of the latter, as if to give her something. When they came to the extremity of the abdomen, they took the eggs from her, carried them away, and piled them carefully together in some part of the chamber, or in the bowl under, or behind any broken pieces of clay which lay most conveniently for the purpose.

## *THE ANT-LION*

IS the caterpillar of a fly somewhat resembling the dragon-fly, and derives its name from living principally on ants. In the mode of taking its prey, and in the figure of its body, this insect is not much unlike the spider. Its body is composed of several rings, and its colour is a dirty grey, marked with black spots. The head is small and flat, and from this proceed two horns, each about the sixth of an inch long, hard, hollow, and hooked at the end. The jaws are hollow, and serve as pumps to draw into its stomach the juices of those insects on which it feeds; for in the head there is no mouth, nor any other organ which can answer the same purpose. The horns being therefore so necessary to its life, nature has provided for the restoring of them in case of accident; for, if cut off, they are found to grow again.

The ant-lion, though said to be a native of this country, has been very rarely discovered here: it is very seldom found in its perfect state, but is sometimes to be met with in sandy places, and near rivulets.

This animal, in its larva state, obtains its food only by stratagem. His usual situation is in a dry sandy soil, under some old wall or other protection from the wind. Here he forms a pit of the shape of a funnel. If this is only to be small, he thrusts himself backward pretty deep, and artfully throws out the loose sand, which has fallen in upon him, beyond the edges of the hollow, and at the bottom he then lies concealed. If it is to be of greater extent, he begins by first tracing in the surface of the sand a tolerably large circle, which is to form its base. He then gets under the sand near the edge, and, proceeding backwards in a spiral direction, carefully throws up all the particles that fall upon his body beyond the circumference of the circle: this he continues till he arrives at the apex of the cone he has thus formed. His long neck, and flat head, he uses as a spade; and the strength of these parts is so great that he is able to throw off at once a considerable quantity of sand to even six inches distance. His pit being finished, he buries himself among the sand at the bottom, leaving only his horns visible. Here he patiently waits for his prey. When an ant or any other small insect happens to walk over the edges of the hollow, its steps force down some of the particles, which gives the ant-lion notice of its presence. He immediately throws up the sand which covers his head, to overwhelm the ant, and, with its returning force, bring it to the bottom: this he continues to do till the insect is overcome, and falls between his horns. Every endeavour to escape, when once the incautious ant has stepped within the verge of the pit, is vain; for in all its attempts to climb the side, the deceptious sand slips from under its feet, and every struggle precipitates it still lower. When within reach, its enemy plunges the points of his jaws into its body, and, having sucked out all its juices, throws out the empty skin to some distance, that the den may not become frightful to others by seeing their fellow carcases strewed about. This done, the insect mounts the edges of his pit, and repairs whatever injury it may have sustained; and then, descending, again conceals himself at the bottom.

As this creature has no power of catching its prey in any other way, but by its pit (which, however, procures it but little food) its motions are very slow, and therefore some have believed that its catching now and then an ant by this means, was rather an act of diversion than hunger. But though the ant-lion will live a long time without food, and even pass through all its changes when shut up in a box, yet it is always ready to eat when food is offered to it. It always appears starved and small when kept thus; and if a fly be given to it in that hungry state, it will suck out all its juices so perfectly that the remaining shell may be rubbed to powder between the fingers, whilst the body of the creature that has sucked it appears remarkably swelled and distended.

M. Poupart put an ant-lion, for the sake of experiment, into a wooden box with some sand, and covered it with a glass, so as to exclude every other insect. Here it formed its cone, and watched as usual for prey, though in vain. Thus he kept it for several months, while in an adjoining box he kept another of the same species, which he supplied with food by giving it ants and flies pretty regularly. He could perceive no difference between the movements or actions of the two; but, when he took them from their holes, he found the abdomen of that which had received no food was shrunk to a very diminutive size, whilst the other retained its proper shape.

If the ant-lion form its pit in a bed of pure sand, it is made and repaired with great ease; but, where it meets with other substances among the sand, that labour becomes much more embarrassing. If, for instance, when the creature has half formed it, it comes to a stone of some moderate size, it does not desert the work on this account, but goes on, intending to remove that impediment the last. When the pit is finished, it crawls backward up the side of the place where the stone is; and, getting its tail under it, takes great pains and time to get it on a true poise, and then begins to crawl backward with it up the edge to the top of the pit to get it out of the way. It is a very common thing to see the ant-lion labouring in this manner at a stone four times as big as its own body; and as it can only move backward, and the poise is difficult to keep, especially up a slope of such crumbling matter as sand, which moulders away from under its feet, and necessarily alters the position of its body, the stone very frequently rolls down, when near the verge, quite to the bottom. In this case the animal attacks it again in the same way, and is not often discouraged by five or six miscarriages; but continues its struggles so long that it at length gets it over the verge of the place. When it has done this, it does not leave it there, lest it should roll in again; but is always at the pains of pushing it farther on, till it has removed it to a necessary distance from the edge of the pit.

When this insect has lived its usual time in the larva state, it leaves its pit, and buries itself under the surface of the sand. Here it incloses itself in a fine web, in which it is to pass its transformation into a winged state. This web is made of a sort of silk, which the creature spins in the manner of the spider, and of a quantity of the grains of sand cemented together by a glutinous humour which flows from its pores. This case, however, would be too harsh and coarse for the body of the creature, and therefore it serves only for the covering, to defend it from external injuries; the animal spinning one of pure and incomparably fine silk, of a beautiful pearl colour, within it, which covers its whole body. Having lain some time in this case, it throws off its outer skin, and becomes an oblong nymph or chrysalis, in which a careful eye may trace the form of the fly into which it is to be transformed. This nymph makes its way about half out of the shell, and remains in this condition, but without further life or motion, till the perfect fly comes out at a slit in the back.

## *WEEVILS.*

ONE division of the weevils feed on trees and shrubs, inserting their beak into the tender branches, and by these means extracting their juices. Another division feed solely on plants. Several live on grain, wood, and on some of the species of fungi, and a few under the surface of the earth.

The corn weevil is of a black-brown colour, and scarcely more than a tenth of an inch in length. Its snout is long and small; and the thorax is punctured, and nearly as long as the abdomen.

The parent insect lays its eggs in grains of corn, probably one in each grain. Here the larvæ, on being hatched, continue for some time to live, and it is very difficult to discover them, as they lie concealed within. They increase their size, and with it their dwelling, at the expense of the interior or farinaceous parts of the grain on which they feed. Corn-lofts are often laid waste by these grubs, whose numbers are sometimes so great as to devour nearly the whole of their contents. When the grub has attained its full size, it still remains within the grain, hidden under the empty husk. There, being transformed, it becomes a chrysalis; and, when it has attained its perfect state, it forces its way out.

The grains that are thus attacked, being in exterior appearance still large and full, are not easily discovered by the eye. If, however, they are thrown into water, their lightness soon detects them.

In order to rid a granary of these destructive insects, farmers are told to spread their corn in the sun, when they will creep out of their holes; and, by often stirring the corn while in this situation, it is supposed they may be completely expelled. It is also said that they may be destroyed by strewing boughs of elder, or branches of henbane among the corn. But a more effectual mode of banishing them was adopted by a gentleman in Paris, who, about the month of June, when his granaries and barns, that had been much infested by weevils, were all empty, caused a number of the hills of the large ants to be collected in bags, and placed in different parts about them. The ants immediately attacked the weevils that were on the walls and other parts, and destroyed them so completely, that, in a very short time, not a single one was to be seen; and since that period they have never appeared on his premises.

The nut weevil is produced from the white grub that is often found living in the interior of the hazel nut. The history of its changes and growth is not only singular but interesting; the caterpillar or grub proceeds from a very small brown egg that the parent deposits on the outside of the nut, at a time when it is very soft and tender. When the heat of the season has perfected the little grub, it eats its way out of the egg, and through the shell into the nut, without in the least injuring the external appearance of the nut. His chief food now is the coat of the nut, or that part which afterwards hardens into the shell; and he continues to feed on this, and the interior pulp, till such time as the one becomes too hard, and the other too dry for his sustenance. He then begins on the kernel, which is now grown so large as to afford him support: and it is to be remarked that this seems a most providential instinct, for had he commenced his attacks on the kernel when it was small, he would have destroyed that on which all his future welfare depended, and that which is the principal food allotted to him by nature while in a larva state. While feeding, he constantly attends to the hole by which he entered, gnawing away the sides, so as to make them very round and smooth; for this not only allows him sufficient air, and a place through which he can expel the particles of his dung, but it is also the passage through which, when he is full fed, and ready to undergo his change, he makes his way out. About the month of September, or perhaps somewhat later, the nut becomes ripe and falls to the ground. At this time he is generally prepared for the change, and works himself through the hole, which he is some time in doing, as it is much less in circumference than his body. He then buries himself in the earth, and, shortly after, changes into a chrysalis, in which state he remains till the following spring, and about the beginning of May assumes his beetle form. The insect, when in this state, is about a quarter of an inch in length, and of a grey-brown colour. The body is somewhat of an oval shape, having the posterior extremity not rounded off, but ending in a point. The beak, or rostrum, is red; and as long as the body.

## THE TIMBER CAPRICORN.

THIS animal is very destructive to timber. Its body is of a dark violet, somewhat hairy and punctured. The thorax is rounded and downy; and the antennæ are nearly as long as the body. The wing cases are narrow, rounded at the tip, and bulging towards the base. The head and thorax are sometimes greenish. The jaws are wonderfully adapted for penetration; they are large, thick, and solid sections of a cone divided longitudinally, which, in the act of mastication, apply to each other the whole of their interior plane surface, so that they grind the insect's food like a pair of millstones. The body is from four lines and a half to seven and a half in length.

The timber capricorn, both in a perfect and larva state, feeds principally on fir timber which has been felled some time, without having had the bark stripped off; but it is often found on other wood. Though now too common in this kingdom, it is supposed not to have been originally a native.

The female is furnished at the posterior extremity of her body with a flat retractile tube, This she inserts between the bark and the wood, to the depth of about a quarter of an inch, and there deposits a single egg. By stripping off the bark, it is easy to trace the whole progress of the larva, from the spot where it is hatched to that where it attains its full size. It first proceeds in a serpentine direction, filling the space which it leaves with its excrement, resembling saw-dust, and stopping all ingress to enemies from without. When it has arrived at its utmost dimensions, it does not confine itself to one direction, but works in a kind of labyrinth, eating backwards and forwards, which gives the wood under the bark a very irregular surface: by this means its paths are rendered of considerable width. The bed of its paths exhibits, when closely examined, a curious appearance, occasioned by the erosions of its jaws, which excavate an infinity of little ramified canals. When the insect is about to assume its chrysalis state, it bores down obliquely into the solid wood, to the depth sometimes of three inches, and seldom, if ever, less than two. These holes are nearly semi-cylindrical, expressing exactly the form of the grub.

The larvæ are destitute of feet, pale, folded, somewhat hairy, convex above, and divided into thirteen segments. Their head is large and convex. Some of the larvæ are hatched in October; and it is supposed that about the beginning of March they assume their chrysalis state. At the place in the bark, opposite to the hole from whence they descended into the wood, the perfect insects gnaw their way out, which generally takes place betwixt the middle of May and the middle of June. These insects are supposed to fly only in the night, but during the day they may generally be found resting on the wood from whence they were disclosed.

All the insects of this tribe are among the most beautiful that are produced. Many of the species diffuse a strong, but seldom an unpleasant smell, perceptible at a great distance, and some of them, when seized, emit a sort of cry, produced by the friction of the thorax, or the upper part of the abdomen and wing cases.

## CHAP. VIII.

"In the nice *bee* what sense so subtly true,
From pois'nous herbs extracts the healing dew."

POPE.

## THE HIVE BEE.

THE first remarkable part in the structure of the common working bee, which should be noticed, is the trunk, which serves to extract the honey from flowers. It is not formed, like that of other flies, in the manner of a tube, by which the fluid is to be sucked up; but like a besom, to sweep, or a tongue, to lick it away. The animal is furnished also with teeth, which serve it in making wax, which is also gathered from flowers, like honey. In the thighs of the hind legs there are two cavities, edged with hair; and into these, as into a basket, the animal sticks its pellets. Thus employed, the bee flies from flower to flower, increasing its store, and adding to its stock of wax, until the bale, upon each thigh, becomes as big as a grain of pepper; by this time having got a sufficient load, it returns, making the best of its way to the hive. Its belly is divided into six rings, which shorten the body, by slipping one over the other. It contains within it, beside the intestines, the honey-bag, the venom-bag, and the sting. The honey-bag is as transparent as crystal, containing the honey that the bee has brushed from the flowers; of which the greater part is carried to the hive, and poured into the cells of the honey-comb; while the remainder serves for the bee's own nourishment: for, during summer, it never touches what has been laid up for the winter. The sting, which serves to defend this little animal from its enemies, is composed of three parts; the sheath, and two darts, which are extremely small and penetrating. Both the darts have several small points, or barbs, like those of a fish-hook, which renders the sting more painful, and makes the darts rankle in the wound. Still, however, this instrument would be very slight, did not the bee poison the wound. The sheath, sometimes sticks so fast in the wound, that the animal is obliged to leave it behind; by which the bee soon after dies, and the wound is considerably enflamed. It might at first appear well for mankind, if the bee were without its sting: but, upon recollection, it will be found that the little animal would then have too many rivals in sharing its labours. An hundred other lazy animals, fond of honey, and hating labour, would intrude upon the sweets of the hive; and the treasure would be carried off, for want of armed guardians to protect it.

There are three different kinds of bees in every hive. The labouring bees, which make up the far greatest number, and are thought to be neither male or female, but merely born for the purposes of labour, and continuing the breed, by supplying the young with provisions, while yet in their helpless state. Also the drones, which are of a darker colour, longer, and more thick by one third than the former; these are supposed to be the males; and there are not above a hundred of them, in a hive of seven or eight thousand bees. The third sort is called queen bees, and are said to lay all the eggs from which the whole swarm is hatched in the season. These are still larger and fewer in number; some assert that there is not above one in every swarm: but this later observers affirm not to be true, there being sometimes five or six in the same hive.

This animal lives in society, and is not only subject to laws, but is active, vigilant, laborious, and disinterested. All its provisions are laid up for the community; and all its arts in building a cell, designed for the benefit of posterity. The substance with which bees build their cells is wax; which is fashioned into convenient apartments for themselves and their young. When they begin to work in their hives, they divide themselves into four companies; one of which roves in the fields in search of materials; another employs itself in laying out the bottom and partitions of their cells; a third is employed in making the inside smooth from the corners and angles; and the fourth company bring food for the rest, or relieve those who return with their respective burthens. But they are not constant to one employment: they often change the tasks assigned them; those that have been at work, being permitted to go abroad; and those that have been in the fields already, take their places. Their labour and diligence are so great, that, in a day's time, they are able to make cells, which lie upon each other, numerous enough to contain three thousand bees. These cells are formed in the exactest proportion. Pappus, an ancient geometrician, said, that of all figures, hexagons were the most convenient; for, when placed touching each other, the most convenient room would be given, and the smallest lost. The cells of the bees are perfect hexagons: these, in every honey-comb, are double, opening on either side, and closed at the bottom. The bottoms are composed of little triangular panes, which, when united together, terminate in a point, and lie exactly upon the extremities of other panes of the same shape, in opposite cells. These lodgings have spaces, like streets, between them, large enough for the purposes hereafter mentioned; and yet narrow enough to preserve the necessary heat. The mouth of every cell is defended by a border, which makes the door a little less than the inside of the cell, which serves to strengthen the whole. These cells serve for different purposes; for laying up their young, for their wax, and for their honey, which is their chief food.

As the habitation of bees requires to be very close, what their hives want, from the negligence or unskilfulness of man, these animals supply by their own industry: so that it is their principal care, when first hived, to stop up all their crannies. For this purpose, they make use of a resinous gum, which is more tenacious than wax, and differs greatly from it. This the ancients called propolis: it will grow considerably hard in June; though it will in some measure soften by heat; and is often found different in consistence, colour, and smell. It has generally an agreeable aromatic odour when it is warmed; and by some it is considered as a most grateful perfume. When the bees begin to work with it, it is soft, but it acquires a firmer consistence every day; till at length it assumes a brown colour, and becomes much harder than wax. The bees carry it on their hinder legs; and some think it is met with on the birch, the willow, and poplar.

If examined through a glass hive, from the hurry the whole swarm is in, the whole at first appears like anarchy and confusion: but the spectator soon finds every animal diligently employed, and following one pursuit, with a settled purpose. Their teeth are the instruments by which they model and fashion their various buildings, and give them such symmetry and perfection. They begin at the top of the hive; and several of them work at a time, at the cells which have two faces. If they are stinted with regard to time, they give the new cells but half the depth which they ought to have; leaving them imperfect, till they have sketched out the number of cells necessary for the present occasion. The construction of their combs, costs them a great deal of labour: they are made by insensible additions; and not cast at once in a mold. It is difficult to perceive, even with the assistance of glass hives, the manner in which bees operate when constructing their cells. They are so eager to afford mutual assistance; and for this purpose so many of them crowd together, and are perpetually succeeding each other, that their individual operations can seldom be distinctly observed. It has, however, been plainly discovered that their two jaws are the only instruments they employ in modelling and polishing the wax. With a little patience and attention, we perceive cells just begun: we likewise remark the quickness with which a bee moves its teeth against a small portion of the cell. This portion the animal, by repeated strokes on each side, smooths, renders compact, and reduces to a proper thinness. While some of the hive are lengthening their hexagonal tubes, others are laying the foundations of new ones. In certain circumstances, when extremely hurried, they do not complete their new cells, but leave them imperfect till they have begun a number of sufficient for their present exigences. When a bee puts its head a little way into a cell, we easily perceive it scraping the walls with the points of its teeth, in order to detach such useless and irregular fragments as may have been left in the work. Of these fragments the bee forms a ball about the size of a pin's head, comes out of the cell, and carries this wax to another part of the work, where it is wanted: it no sooner leaves the cell, than it is succeeded by another bee which performs the same office; and in this manner the work is successively carried on till the cell is completely polished.

The mode of these animals working, and the disposition and division of their labour, when put into an empty hive, are proofs of their sagacity. They immediately begin to lay the foundations of their combs, which they execute with surprising quickness and alacrity. Soon after they begin to construct one comb; they divide into companies, as observed, each of which in different parts of the hive is occupied in the same operations. By this division of labour, a great number of bees have an opportunity of being employed at the same time, and, consequently, the common work is sooner finished. The combs are generally arranged in a direction parallel to each other. An interval or street between them is always left, that the bees may have a free passage, and an easy communication with the different combs in the hive. These streets are just wide enough to allow two bees to pass one another. Beside these parallel streets, to shorten their journey when working, they leave several cross passages, which are always covered. The cells for their young are most carefully formed; those designed for lodging the drones, are larger than the rest; and that for the queen-bee, the largest of all.

Honey is not the only food upon which these animals subsist. The meal of flowers, of which their wax is formed, is one of the most favourite repasts. This is a diet which they live upon during the summer, and of which they lay up a large winter provision. The wax of which their combs are made, is no more than this meal digested, and wrought into a paste. When the flowers upon which bees generally feed, are not fully blown, and this meal or dust is not offered in sufficient quantities, the bees pinch the tops of the stamina in which it is contained, with their teeth: and thus anticipate the progress of vegetation. In April and May the bees are busy, from morning to evening, in gathering this meal; but when the weather becomes too hot in the midst of summer, they work only in the morning.

This animal is furnished with a stomach for its wax as well as its honey. In the former of the two, their powder is altered, digested and concocted into real wax; and is thus ejected by the same passage by which it was swallowed. Every comb, newly made, is white: but it becomes yellow as it grows old, and almost black when kept too long in the hive. Beside the wax thus digested, there is a large portion of the powder kneaded up for food in every hive, and kept in separate cells, for winter provision: this is called bee-bread, and contributes to the health and strength of the animal during winter.

The propolis, and the materials for making wax, are not the only substances that these industrious animals have to collect. As, besides the whole winter, there are many days in summer in which the bees are prevented by the weather from going abroad in quest of provisions, they are, therefore, under the necessity of collecting and amassing in cells destined for that purpose large quantities of honey. This they extract by means of their trunk, as before observed, from the nectariferous glands of flowers. After collecting a few small drops of honey with this, the animal carries them to its mouth, and swallows them. From the gullet they pass into the first stomach, which is more or less swelled in proportion to the quantity of honey it contains. When empty, it has the appearance of a fine white thread: but, when filled with honey, it assumes the figure of an oblong bladder, the membrane of which is so thin and transparent that it allows the colour of the liquid it contains to be distinctly seen. This bladder is well known to children who live in the country: they cruelly amuse themselves with catching bees, and tearing them asunder in order to suck the honey. The bees are obliged to fly from one flower to another till they fill their first stomachs. When they have accomplished this, they return directly to the hive, and disgorge in a cell the whole honey they have collected. It not unfrequently happens, however, that on its way to the hive the bee is accosted by a hungry companion. How the one manages to communicate its wants to the other it is perhaps impossible to discover. But the fact is certain, that, when two bees meet in this situation, they mutually stop, and the one whose stomach is full of honey extends its trunk, opens its mouth, and, like a ruminating animal, forces up the honey into that cavity. The hungry bee, with the point of its trunk, sucks the honey from the other's mouth. When not stopped on the road, the bee proceeds to the hive, and in the same manner offers its honey to those who are at work, as if it meant to prevent the necessity of quitting their labour in order to go in quest of food. In bad weather, the bees feed on the honey laid up in open cells; but they never touch their reservoirs while their companions are enabled to supply them with fresh honey from the fields. But the mouths of those cells which are destined for preserving honey during the winter they always cover with a lid or thin plate of wax.

Numerous as the bees in one swarm appear, they all originate from a single parent. It is indeed surprising, that one small insect should in a few months give birth to so many young; but, Reaumur declares, that, on opening her body at a certain time of the year, eggs to the number of many thousands are to be found contained in it; he found no less that five thousand eggs at one time.

The queen bee is easily distinguished from the rest by the size and shape of her body. On her depends the welfare of the whole community; and, by the attention that is paid to all her movements, it is evident how much they depend on her security. She is seen at times with a numerous retinue, marching from cell, to cell, plunging the extremity of her body into each of them, and leaving in each an egg. A day or two after this is deposited, the grub is excluded from the shell, having the shape of a maggot rolled up in a ring, and lying softly on a bed of whitish-coloured jelly, on which it begins to feed. The common bees then attend with astonishing tenderness and anxiety: they furnish it with food, and watch over it with unremitting assiduity. In about six days the grub arrives at its full growth, when its affectionate attendants shut up the mouth of its apartment with wax, to secure it from injury. Thus inclosed, it soon begins to line the walls of its cell with a silken tapestry, in which it undergoes its last transformation. When it first crawls forth a winged insect, it is very weak and inactive, but in the course of a few hours it acquires strength enough to fly off to its labour. On its emerging from the cell, the officious bees flock round it, and lick up its moisture with their tongues. One party bring honey for it to feed upon; and another is employed in cleansing the cell, and carrying out the filth to prepare this for a new inhabitant.

The neuter bees in a hive amount to the number of sixteen or eighteen thousand; these are armed with stings. The drones are unarmed, and are always killed by the neuters about the month of September.

There is so great a degree of attachment subsisting between the working bees and their queen that, if by any accident she be destroyed, the labours of the community are at an end, and the rest of the animals leave their hive and disperse. If, however, another queen be given them, joy springs up, and they crowd around her, and soon again apply to their operations. Even the prospect of seeing a queen will support them: this has been proved by giving to a hive that had lost its own queen the chrysalis of another. If a queen bee be taken from a hive and kept apart from the working bees, she will refuse to eat, and in the course of four or five days, will die of hunger.

The least degree of cold benumbs these insects;

and in winter, unless they are all crowded together, they perish. Their enemies are the wasp and the hornet, who with their teeth rip them open to suck out the honey contained in their bladder. Sparrows have also been seen with one in their bill, and another in each claw.

The ingenious Mr. Wildham possessed a secret by which he could at any time cause a hive of bees to swarm upon his head, shoulders, or body, in a most surprizing manner. He has been seen to drink a glass of wine with the bees all over his head and face more than an inch deep. Several fell into his glass, but they knew him too well to sting him. He could even act the part of a general with them, by marshalling them in battle array upon a large table. There he divided them into regiments, battalions, and companies, according to military discipline, waiting only for his word of command. The moment he uttered the word "march!" they began to march in a very regular manner in rank and file, in the manner of soldiers. To these, his lilliputians, he also taught so much politeness that they never attempted to sting any of the numerous company which, at different times, resorted to admire this singular spectacle. About thirty-five years ago, Mrs. Astley, (wife of Mr. Astley, Sen.) used to exhibit a swarm of bees on her arms, shoulders, &c.

The humble bees are as large as the first joint of a man's middle finger. These are seen in every field and perched on every flower. They build their nest in holes in the ground, of dry leaves, mixed with wax and wool, defended with moss from the weather. Each humble-bee makes a separate cell, about the size of a small nutmeg, which is round and hollow, containing the honey in a bag. Several of these cells are joined together, in such a manner, that the whole appears like a cluster of grapes. The females, which have the appearance of wasps, are very few, and their eggs are laid in cells, which the rest soon cover over with wax. It is uncertain whether they have a queen or not; but there is one much larger than the rest, without wings, and without hair, and all over black, like polished ebony; This goes and views all the works from time to time, and enters into the cell, as if it wanted to see whether every thing was done right: in the morning, the young humble-bees are very idle, and seem not at all inclined to labour, till one of the largest, about seven o'clock, thrusts half its body from a hole, designed for that purpose, and seated on the top of the nest, beats its wings for twenty minutes successively buzzing the whole time, till the whole colony is put in motion. The humble-bees gather honey, as well as the common bees; but it is neither so fine, nor so good, nor the wax so clean, or so capable of fusion.

## THE CARDING BEE AND OTHERS.

Almost all the carding bees perish in the winter; a few of the females only survive. These usually make their appearance early in the spring, as soon as the catkins of the willows are in blossom; upon which, at this time, they may commonly be seen collecting honey from the female, and pollen from the male catkins. The neuters do not appear till the spring is somewhat advanced; and the males are most common in autumn, when the thistles are in blossom, upon the flowers of which they are abundant, sometimes seemingly asleep, or torpid, and, at other times, acting as if intoxicated with the sweets they have been imbibing.

Their nest are usually formed in meadows and pasture, sometimes in groves and hedge-rows, where the soil is entangled with roots; but now and then these are found in heaps of stones. When they do not meet an accidental cavity ready made, they excavate one themselves with great labour. This they cover with a thick convex vault of moss, sometimes casing the interior surface with a kind of coarse wax to keep out the wet. At the lower part of the nest there is an opening for the inhabitants to go in and out at. This entrance is often through a long gallery, or covered way, a foot or upwards in length, by which the nest is more effectually concealed from observation. The mode in which they transport the moss they use in their nest is singular. When they have discovered a parcel fitted to their purpose, and conveniently situated, they place themselves in a line, with their back turned towards the nest. The foremost lays hold of some with her jaws, and clears it bit by bit with her fore feet: when this is sufficiently disentangled, she drives with her feet under her belly, and as far as possible beyond, to the second. The second, in like manner, pushes it on to the third, and so on. Thus small heaps of prepared moss are conveyed to the nest by a file of four or five insects, where they are wrought and interwoven with the greatest dexterity by those that remain within.

The nests are often six or seven inches in diameter, and elevated to the height of four or five inches above the surface of the ground. When the covering of moss is taken up, an irregular comb presents itself, composed of an assemblage of oval bodies disposed one against another. Sometimes there are two or three combs, placed on one another, but not united. These combs vary in size: they consist of a number of oblong or oval cells or coccoons, of a silky substance, fastened together, and spun by the larvæ when they are about to undergo their first change; for the carding bees do not form waxen cells for their young. The cells are of three dimensions, answering to the three sexes. The void spaces between the cells are filled with masses of brown paste, made of gross wax, or pollen much wrought, and honey. Besides the masses they attach to every comb, particularly the uppermost, three or four cells of the same coarse wax, in the shape of goblets, open at the top, which they fill with liquid and very sweet honey. The first step towards furnishing a nest is to make a mass of the brown paste, and one of these honey-pots. The masses of paste are intended for the food of the larvæ, and in them the eggs are deposited. These vary in number, from three to thirty being to be found in one mass, but not all in the same cavity. The nests seldom contain more than fifty or sixty inhabitants. Of these the females (of which there is móre than one in a nest) are the largest. The males are of a middle size, as is also one description of working-bees or neuters: the other neuters are the smallest, and not bigger than the hive bee. These two sorts of neuters, it is most probable, are appropriated to different kinds of works; the largest being the strongest, and the others the most lively, active, and expert. In this community, both the females and males act in concert with the neuters in fitting up or repairing their habitations.—The nests of the carding-bees are exposed to various depredators; but field-mice and pole-cats are their most formidable enemies.

The larvæ are similar to those of the hive bee, but their sides are marked by irregular transverse black spots. These, after, they are hatched, separate from each other, eating the paste that surrounds them. The honey-pots may be intended to supply honey for the occasional moistening of the paste in making repairs, &c. The pupa in each cell is placed with its head downwards, and makes its way out at the bottom of its coccoon.

When these animals, of any sex, are walking on the ground, if a finger be moved to them, they lift up three legs on one side, by way of defence; which gives them a very grotesque appearance.

The orange-tailed bee, is one of the largest of the British bees; but it varies in size, being sometimes half an inch, and sometimes an inch in length. Its body is black or dark brown, and hairy; and the extremity of the abdomen of a bright orange colour. The wings are light brown.

These insects construct nests of a very elegant appearance, being of an oval form, and composed of bits of the larger mosses, closely and neatly compacted together. A small round hole or entrance is left on one side. These nests are about four inches in diameter on the exterior, and are generally formed on dry shady banks, in woods, lanes, or meadows. The food laid up for the larvæ consists of a kind of honey of a brownish colour, disposed in somewhat irregula masses or heaps; for these bees do not form any regular cells or combs, like some of the others.

The poppy is a little black bee, about the third of an inch in length. Its head and trunk are thickly covered with hairs of a dirty grey-clour; and the under part of its body are clad with greyish hairs. The abdomen is somewhat conical, black, and shining; but its segments are fringed with white hairs.—The male is nearly of the same length as the female, but rather narrower, and somewhat more hairy. Its abdomen is inflexed, and not so hairy underneath as above. The last segment terminates in a fork with blunt teeth, and has on each side of its base a sharp spine or point.

The poppy bee forms her nest in the ground, burrowing to the depth of about three inches At the bottom she makes a large and somewhat hemispherical cavity, which, after being rendered perfectly smooth on all sides, she carefully lines with a splendid tapestry, selected from the scarlet flowers of the wild poppy. From these, with great dexterity, she cuts pieces of proper size and form, which she conveys to her cell; and, beginning at the bottom, covers with it the whole interior of this habitation of her future progeny. The covering is even sometimes extended a little way round the orifice. The bottom is rendered warm by three or four coats, and the sides have never less than two. When the little animal has completed her apartment, she fills it with paste, made of pollen and honey, to the height of seven or eight lines; and, after depositing an egg, she pushes down the poppy-lining till it completely covers the cell, and then closes up its mouth with earth so nicely as to render it not distinguishable from the adjoining soil.

The leaf-cutting bees construct cylindrical nests, of the leaves of the rose and other trees, which are sometimes of the length of six inches, and generally consist of six or seven cells, each shaped like a thimble. They are formed with the convex end of one fitting into the open end of another. The portions of leaf of which they are made are not glued together, nor are they any otherwise fastened than in the nicety of their adjustment to each other; and yet they do not admit the liquid honey to drain through them. The interior surface of each cell consists of three pieces of leaf, of equal size, narrow at one end, but gradually widening to the other, where the width equals half the length. One side of each of these pieces is the serrated margin of the leaf from which it was cut. In forming the cell, the pieces of leaf are made to lap one over the other (the serrated side always outermost) till a tube is thus formed coated with three, four, or more layers. In coating these tubes, the provident little animal is careful to lay the middle of each piece of leaf over the margins of others, so as by this means both to cover and strengthen the junctions. At the closed or narrow end of the cell, the leaves are bent down so as to form a convex termination. When a cell is formed, the next care of the bee is to fill it with honey and pollen, which, being collected chiefly from the thistles, form a rose-coloured paste. With these it is filled to within about half a line of the orifice; and she then deposits in it an egg, and closes it with three perfectly circular pieces of leaf, which coincide so exactly with the walls of the cylindrical cell, as to be retained in their situation without any gluten. After this covering is fitted in, there still remains a hollow which receives the convex end of the succeeding cell. In this manner the patient and indefatigable animal proceeds till her whole cylinder of six or seven cells is completed. This is said to be generally formed under the surface of the ground (or as Kirby says, in cavities of walls and decayed wood) in a fistular passage, which it entirely fills except at the entrance. If, by any accident, the labour of these insects is interrupted, or the edifice is deranged, they exhibit astonishing perseverance in setting it again to rights. This mode of forming a nest is not confined to the present species, as several others perform similar operations; but they adopt the leaves of different trees for this purpose; such as the horse-chesnut, the elm, &c.

When one of these bees selects a rose-bush with the view of cutting pieces out of the leaves, she flies round, or hovers over it for some seconds, as if examining for the leaves best suited to her purpose. When she has chosen one, she alights upon it, sometimes on the under surface, or not unfrequently on its edge, so that the margin passes between her legs. Her first attack, which is generally made the moment she alights, is usually near the footstalk, with her head turned towards the point. As soon as she begins to cut, she is entirely intent on her labour; nor does she cease till her work is completed: this is done with her strong jaws, with as much expedition as we could exert with a pair of scissars. As she proceeds, she keeps the margin of the detached part between her legs, in such a manner that the section keeps giving way to her, and does not interrupt her progress. She makes her incision in a curve line approaching the midrib of the leaf at first; but, when she has reached a certain point, she recedes from this towards the margin, still cutting in a curve. When she has nearly detached the portion she has been employed upon from the leaf, she balances her little wings for flight, lest its weight should carry her to the ground; and the very moment it parts she flies off with it in triumph, in a bent position between her legs, and perpendicular to her body.

The larvæ of these insects do not differ in appearance from those of the hive-bees. When arrived at their full size, they spin a coccoon of silk, thick and solid, which they attach to the sides of their cell. Those produced first are from the first-laid eggs; so that, when ready to emerge into the air, in passing through the bottom of their cells, they do not interrupt each other's progress. These larvæ are exposed to the attacks of other insects, that make their way into the cells and deposit their eggs there.

The mason bee (which is also one of the solitary species) is about nine lines, or three quarters of an inch in length. Its body is black, and thickly clad with black hairs. The jaws are very large and prominent, and terminate in two blunt teeth. The wings are black with a tinge of violet. The abdomen is somewhat conical, and has underneath a patch of orange-coloured hairs. The terminating joints of the legs are reddish. The male is covered with red hairs. This bee takes its name from the circumstance of constructing a nest of mud or mortar; which, on its exterior, has so little of a regular appearance, that it is generally regarded as a piece of dirt accidentally adhering to a wall. Within, however, it is furnished with regular cells, each of which affords convenient lodgment to a white larva much resembling that of the hive bee. In building this nest, which is a work of great labour and art, the female is the sole operator, receiving no assistance whatever from the male. After fixing upon an angle, sheltered by any projection, on the south side of a stone wall, or upon some rough part of its surface, she goes in quest of the necessary materials. Her nest is to be constructed of a kind of mortar, of which sand is to be the basis. She is very curious in her choice of this, selecting it with her jaws grain by grain. To shorten her labour, before she transports it for use, she glues together, by means of a viscid saliva from her body, as many grains as she can carry: these form a little mass, about the size of a small shot. Taking this up in her jaws, she conveys it to the place she has fixed upon for the site of her house. She labours incessantly till her whole work is completed, which usually occupies five or six days. The number of cells in one nest are from three to fifteen: these are all similar, and nearly equal in dimensions, each being about an inch high, half an inch diameter; and, before its orifice is closed, resembling a thimble in shape. When a cell is raised to somewhat more than half its height, our little mason lays up in it a store of pollen, seasoned with honey, for the sustenance of its future inhabitant. This being done, she deposits her egg, finishes and covers her cell, and then proceeds to the erection of a second, which she furnishes and finishes in the same manner; and so on till the work is completed. These cells are not placed in any regular order: some are parallel with the wall, others perpendicular to it, and others are inclined to it at different angles. This occasions many empty spaces between the cells, which the laborious architect fills up with the same kind of cement, and then bestows on the whole group a common covering, made with coarser grains of sand; so that at length the nest becomes a mass of mortar, so hard as not easily to be penetrated even by the blade of a knife.

We may naturally suppose, from the hardness of the materials with which the mason bee constructs her nest, and from the industry and dexterity which she employs to protect her progeny from enemies of every kind, that the young would be in perfect safety, and that their castle would be impregnable. But, notwithstanding all these precautions, they are often devoured by the larvæ of a peculiar species of ichneumon fly, the eggs of which are deposited in the cells before the bee has completed them. But they have an enemy even still more formidable than the ichneumons. A species of beetle insinuates its egg into an unfinished cell: from this proceeds a strong and rapacious grub, armed with prodigious fangs, which often pierces through every cell in the nest, and successively devours all the inhabitants. They have also enemies among themselves, and their nests, which sometimes last for several seasons, are often the cause of desperate conflicts. When one insect has taken possession of a nest, and is gone abroad in quest of materials to repair it, another will frequently come to seize it. When these two meet, a battle invariably ensues. This is always fought in the air. Sometimes the two bees fly with such rapidity and force against each other, that both fall to the ground. But, in general, like birds of prey, the one endeavours to rise above the other, and to give a downward blow. To avoid the stroke, the undermost, instead of flying forward, or laterally, is frequently observed to fly backward. This retrograde flight is likewise performed occasionally by the common house fly, and some other insects, though we are unable to perceive what stimulates them to employ so uncommon a movement.

The wood bees or piercers are larger than the queens of the hive bees. Their bodies are smooth, except the sides, which are covered with hair. In the spring they frequent gardens, and search for rotten or at least for dead wood, in order to make an habitation for their young. They usually choose the decaying uprights of arbours, espaliers, or the props of vines; but will sometimes attack garden seats, thick doors, and window shutters.

The operations of these little animals are very curious; when the female (for she receives no assistance from the male) has selected a piece of wood suited to her purpose, which is most commonly such as is perpendicular to the horizon, she begins her work by boring perpendicularly into it: when she has advanced about half an inch, she changes her direction, and then proceeds nearly parallel with its sides for twelve or fifteen inches, making the hollow about half an inch in diameter. If the wood be sufficiently thick, she sometimes forms three or four of these long holes in its interior: a labour which for a single insect seems prodigious, but in executing it some weeks are often employed. On the ground, for about a foot from the place in which one of these bees is working, little heaps of timber dust are to be seen. These heaps daily increase in size, and the particles that compose them are almost as large as those produced by a hand-saw. The strong jaws of this insect are the only instruments she employs in these perforations. After the holes are prepared, they are divided into ten or twelve separate apartments, each about an inch deep, the roof of one serving for the bottom of another. The divisions are composed of particles of wood, cemented together by a glutinous substance from the animal's body. In making one of these, she commences with glueing an annular plate of wood-dust, about the thickness of half-a-crown, round the internal circumference of the cavity: to this plate she attaches a second, to the second a third, and so on till the whole floor is completed. Before each cell is closed, it is filled with a paste composed of the farina of flowers mixed with honey, and an egg is deposited in it. When the larva is hatched, it has scarcely room sufficient to turn itself in the cell; but as the paste is devoured, the space is enlarged so as to allow it to perform every necessary operation towards changing its state.

M. de Reaumur having been furnished with a piece of wood, about an inch and a half in diameter, that contained the cells of one of these bees, cut off as much of the wood as was sufficient to expose two of the cells to view, in each of which was a larva. To prevent the injuries of the air, he closed the aperture that he had made by pasting it on a bit of glass. The cells were at that time almost entirely filled with paste. The two worms were exceedingly small, and, of course, occupied but little space between the walls of the cells and the mass of paste. As the animals increased in size, the paste daily diminished. In about fifteen days, the paste in each cell was nearly consumed, and the worm, folded in two, occupied the greater part of its habitation. In a week after the provisions of both worms were entirely exhausted. The five or six following days they fasted, which seemed to be a necessary abstinence, during which they were greatly agitated. They often beat their bodies, and elevated and depressed their heads. These movements were preparatory to the great change that the animals were about to undergo. In six days they threw off their skins, and were metamorphosed into nymphs; and they became perfect insects in three weeks afterwards.

As, in a range of cells, the worms must necessarily be of different ages, and of course of different sizes, those in the lower ones are older than those in the superior; because, after the bee has filled with paste and inclosed the first cell, a considerable time is requisite to collect provisions, and to form partitions for every successive and superior cell. The former, therefore, must be transformed into nymphs and flies before the latter. These circumstances would almost appear to be foreseen by the common mother; for, if the undermost worm, which is the oldest, and soonest transformed, was to force its way upward, which it could easily do, it would not only disturb, but infallibly destroy all those lodged in the superior cells. But nature has wisely prevented this devastation; for the head of the nymph, and consequently of the fly, is always placed in a downward direction. Its first instinctive movements must therefore be in the same direction. That the young flies may escape from their respective cells, the mother digs a hole at the bottom of the long tube, which makes a communication between the undermost cell and the open air. Sometimes a similar passage is made near the middle of the tube. By this contrivance, as all the flies instinctively endeavour to cut their way downwards, they find an easy and convenient passage; for they have only to pierce the floor of their cells to make their escape, and this they easily do with their teeth.

The down bee is from half an inch to three quarters in length, of a dark colour, and hairy. On each side of the abdomen are several yellow spots. It is very common about gardens in or near towns, and forms its nest in hollow places in trees, &c. applying to this work the down of the garden campion, and some other woolly plants. The Rev. Mr. White says, that "it is very pleasant to see with what address this insect strips off the down, running from the top to the bottom of a branch, and shaving it bare with all the dexterity of a hoop-shaver. When it has got a vast bundle, almost as large as itself, it flies away, holding it secure between its skin and fore legs."

## *THE WASP.*

OF this animal there are no less than twenty-eight species. The common wasp is longer in proportion to its bulk than the bee; the body is of a golden yellow, having triangular spots down the back part, and black ones on each side; the jaws are notched, and with these it is enabled to cut off and carry away any substance, however hard.

Wasps devour fruit, meat, sweets (particularly the honey of bees, though incapable of gathering honey of its own) and are engaged in continual warfare with almost every other species of fly; they are the inveterate enemies of the common bee, great numbers of which annually become the victims of their rapacity. Every community of wasps, as among bees, is composed of females or queens, drones or males, and neutral or working insects: the two first being employed in the propagation of the species, and the last in nursing, defending, and supporting the rising progeny. Like the bees they also construct hives, and feed sometimes on the produce of flowers. The nest, (in the formation of which, wasps differ greatly from the bees,) is one of the most curious objects in natural history, and is formed with almost as much art as that of the bees. They generally make choice of some hole begun by a field-mouse, a rat, a mole, or any other animal, for the construction of their nest. Sometimes they build in a level situation, but their nests are most commonly found on the side of a bank, to avoid being annoyed by rain or water. The next step, after selecting a proper place, is to enlarge and widen the hole, at which they labor with unwearied assiduity, removing protuberances and carrying away the earth, till it is brought to that spherical figure adapted to their purpose. The outline of their habitation forms a cavity of about a foot and a half each way. Their next care is to construct the paper-like covering with which the whole nest is lined. The material of which this substance is composed is wood, picked up in the fields or elsewhere, which they saw and divide into very small fibres, and by the aid of a glutinous matter with which their bodies are provided, knead this composition into a paste, and employ it in their future building. Returning to their nest with their load of paste, they stick it on that part where they are at work, tread it close with their feet, and trowel it with their trunks, moving backwards as they work. This operation being repeated three or four times, the composition is at length flatted out, till it becomes a leaf much finer than paper, of a pretty firm texture and a grey colour. In this manner they proceed till they have finished the large dome which secures them from the falling in of the earth. When the walls are completed, the cells, formed of the same paper-like substance, next claim their attention. These are arranged horizontally in different stories, sometimes twelve or fifteen above each other; each being supported by colonnades, between which the citizens of this subterraneous common-wealth can walk with the same convenience as men in the streets of a town. The columns are very strong and compact, and larger at each end than in the middle. The cells, though not contructed with that geometrical accuracy which has been so much admired in those of the bee, are yet equally adapted to the purposes for which they are intended. Each comb has only a single range of cells, with the mouth opening below. They are destined, not for the reception of honey, but for the habitation of the young, which are produced from an egg which the female drops into each cell, and sticks in with a kind of gummy matter to prevent its falling out. The egg is white, transparent, and of an oblong shape. From this egg proceeds the insect in its worm-state, which the females are very attentive to supply with the provisions brought home for that purpose by the working wasps. They feed them as birds feed their young, by giving them from time to time a mouthful of food. These worms continue to grow till they entirely fill up the cell, when they cease to eat and begin to spin a very fine silk web with which they close the mouth of their habitation. After they have undergone the usual mode of transformation, the perfect animal breaks forth from its confinement, insensibly acquiring the colour and shape of its parent.

During the summer, the mother wasp continues to lay till she has produced fifteen or sixteen thousand neuters or mules, and about five or six hundred males and females; the commonwealth daily increases in numbers and enjoys tranquillity. But as the sun withdraws they lose their courage and activity. In proportion as the cold increases they become more domestic; rarely leaving the nest, they venture but a short distance from home, flutter about during the noon-day heats, and soon return chilled and feeble. Towards the month of October, provisions grow scarce and a new scene ensues. This hitherto amicable tribe is fired with mutual rage, and the whole edifice presents one scene of indiscriminate massacre. The eggs and the young worms, which a little before they protected with such assiduity, are torn from their cells with undistinguishing fury. Hopes of the state, solicitude for posterity, love for their native place no longer exist, and the whole common-wealth is shaken to its foundation. Rains and frosts succeed; the wasps are seized with disease and languor, and during the winter almost the whole of them die; the working wasps first, the males soon following, and many of the females suffering in the general calamity. In every nest, however, one or two females survive the severity of the winter, and the ensuing spring become the founders of new empires. Unaided by any of her kind, the female, at the beginning of every season, lays the foundation of a new edifice; constructing the first cells, where she deposits her first eggs, which in time become mule wasps, and by these she is assisted in completing the rest of the work.

The females are stronger, and support the rigors of winter better than either the males or neuters. The males, which are not so indolent as those of the honey bee, are never brought forth till towards the end of August; and their sole occupation seems to be that of keeping the nest clean: they carry out every kind of filth, and the bodies of such of their companions as happen to die. In performing this operation, two of them often join; and when the load is too heavy, they cut off the head, and transport the dead animal at different times.

The males also, like those of the honey bees, are destitute of stings; but the females and neuters have stings, the poisonous liquor of which, when introduced into part of the human body, excites inflammation, and creates a considerable degree of pain. This sting consists of a hollow and very sharp-pointed tube, having at its root a bag of pungent juice, which, in the act of stinging, is pressed out, and conveyed through the tube into our flesh. There are also two small, sharp, and bearded spears lying, as in a sheath, within the tube. Dr. Derham counted eight beards on the side of each spear, which, he says, were formed somewhat like the beards of fish-hooks. These spears lie one with its points a little before the other in the sheath, to be ready, in all probability, to be first darted into the flesh; where being once fixed, by means of its foremost beard, the other then strikes in also; and they in this manner alternately pierce deeper, their beards taking more and more hold in the flesh; after which the sting or sheath follows, in order to convey the poison into the wound. The hole in the tube is not exactly at the end, for in that case the instrument would not be so well able to wound: the sting is drawn to a hard and sharp point, and the incision through which the spears and poison are ejected is a little below it. By means of this mechanism it is that the sting, even when parted from the body, is able to pierce and make us smart, and by means of the beards being lodged deep in the flesh, it is also that these insects leave their stings behind them, when they are disturbed, before they have had time to withdraw their spears completely into the tube.

## *THE MANTIS, OR SOOTHSAYER.*

THESE insects possess a figure more romantic and extraordinary than is perhaps exhibited by any other animated being. The singularity of their attitudes has operated so on powerfully credulous and ignorant minds, that superstition has ascribed to them powers not to be found in any part of the history of animated nature.

The extraordinary manner in which the mantis extends its fore-legs, has acquired it the character of a soothsayer, capable of unfolding all the mysteries in the bosom of futurity. Because it frequently sits upon its four hind-legs, with the two fore-legs raised and folded together, the credulous vulgar have supposed it to be then holding intercourse with the Supreme Being, and in the exercise of devotion; hence the peasants of Languedoc have given it the name of the God-prayer. From the peculiar habit of extending its fore-legs sometimes to the right and sometimes to the left, the country people of the same province have attributed to this animal another very useful quality, that of obligingly showing the way to strangers. "It is so divine a creature," says the translator of Mouffet, "that if a child has lost its way, and enquires of the mantis, it will point out the right path with its paw." We are told by Dr. Smith, in his Tour on the Continent, that a gentleman caught a male and female, and put them together in a glass vessel. The female, which in this, as in most other insects, is the largest, after a while devoured first the head and upper parts of her companion, and afterwards all the remainder of the body.

The young are preserved in the egg-state in a kind of oblong bag, of a thick spungy substance; this bag is imbricated on the outside, and fastened lengthwise to the branch of some plant. As the eggs ripen they are protruded through the thick substance of the bag, and the larvæ, which are about half an inch in length, burst from them. The males die in October, and the females soon follow them.

The patience of this insect in waiting for its prey, is remarkable, and the posture to which superstition has attributed devotion is no other than the means it uses to catch it. When it has fixed its eyes on an insect, it very rarely loses sight of it, though it may cost some hours to take it. If it see an insect a little beyond its reach, over its head, it slowly erects its long thorax, by means of the moveable membranes that connect it to the body; then, resting on the posterior legs, it gradually raises the anterior part also. If this bring it near enough to the insect, it throws open the last joint of its fore-paws, and snaps it between the spines that are set in rows on the second joint. If it be unsuccessful it does not retract its paws, but holds them stretched out, and waits again till the insect is within its reach, when it springs up and seizes it. Should the insect go far from the spot, it flies or crawls after it slowly on the ground like a cat; and, when the insect stops, erects itself as before. These animals have a small black pupil or sight, which moves in all directions within the parts that we usually term the eyes, so that they can see their prey in any direction, without having occasion to disturb it by turning their head.

The dry-leaf mantis in its shape and colour is so exceedingly remarkable as to have uniformly suggested the idea of a dry or withered leaf; and the animal, when its wings are closed, bears so great a resemblance to such, that, on a cursory view, it might easily be mistaken for it. It is of a yellowish brown colour. The wings, when closed, from the oval body of the leaf, and the narrow thorax and head resemble the stalk. It is a native of India.

## THE SPHEGES.

THESE insects are chiefly found in woods and hedges; their larvæ feed on dead insects, in the bodies of which the parent spheges deposit their eggs.

The antennæ in this tribe consist of ten joints or articulations; and the mouth is armed with jaws. The wings in both sexes are extended, and do not fold together. The sting is pungent, and concealed within the abdomen.

The turner savage, one of these species, lives in the haunts of men, whom it never willingly offends: but it is the terror of all the smaller insects. It inhabits holes in the earth on the sides of hills and cliffs, and recesses that it forms for itself in the mud-walls of cottages and out-houses. The eggs, as in all the other species, are deposited by the female in the back part of the cells. These are stored with insects, for food to the larvæ, as soon as they come into life, and then filled up.

The antennæ of the common sand-wasp, a kind of sphex, have thirteen articulations, and are inserted in a hollow on the front of the head. The abdomen is club-shaped, and joined to the thorax by a long two-jointed pedicle. The wings are equal, and the colours of the body black and ferruginous alternately.

It is very common about the sandy banks exposed to the sun, in Norfolk and Suffolk, but rare in the neighbourhood of London. It is easily distinguished from other insects by the elongated pedicle of its abdomen, and very short wings. When it flies it always carries its abdomen pointing upwards, so as to be nearly at right angles with that part of the thorax to which it is attached.

The blue sand-wasp is, when it becomes an inhabitant of the air, about three quarters of an inch in length. The antennæ are black, and the wings tinted blue, and tipped with black. It is found in Carolina, and various other parts of North America.

The Pensylvanian sand-wasp is above an inch long, and of a black colour, with the wings inclining to violet. It is an inhabitant of North America, where it feeds on grasshoppers and other insects, as well as on various kinds of fruit. Both these last species form their nests with considerable art and ingenuity.

## *CICADÆ.*

THE wax-forming cicada is found both in the eastern countries and in America. Its wing cases are green, margined with red and deflexed; and the interior ones are spotted with black. The larvæ are elegant and beautiful creatures, and to their labours the Chinese are indebted for the fine white wax that is so much esteemed in the East Indies. They form a sort of white grease which attaches to the branches of trees, hardens there, and becomes wax. It is scraped off in the autumn, melted on the fire, and strained: it is then poured into cold water, where it coagulates and forms into cakes. In appearance it is white and glossy, and, mixed with oil, is used to make candles, for which purpose it is thought greatly superior to bees-wax.

The American locust, another species of cicada, so called on account of their immense numbers, is very common in Pensylvania. They always leave the ground during the night. On their first coming out they are in their chrysalid state; but very soon afterwards the back bursts, and the flying insects disengage themselves from their case. For a little while they are entirely white, with red eyes, and seem very weak and tender; but, by the next day, they attain their full strength and perfection, being of a dark brown colour, with four finely varied transparent wings.

These insects are very active, flying about from tree to tree with great agility. The female is directed to the male by the loud chirping noise that he makes. She lays her eggs about the latter end of May, piercing for this purpose the tender twigs of trees with the dart from her tail. With this she is able to penetrate the wood in a surprisingly expeditious manner, crowding it for the length of two or three inches full of eggs, ranged in close lines, with from twelve to eighteen in each. She always darts to the pith of the branch, in order that the larvæ, when they proceed from the eggs, may find food proper for their tender state. When these are full grown they drop off, and make their way into the ground to prepare for a change. Here they are sometimes found at the depth of two feet or upwards.

Very shortly, after attaining their perfect state, these insects always spread over the country for many miles round. They are exceedingly voracious, and do infinite damage, in their periodical swarmings, to both orchard and forest trees.

The black-headed froghopper is another species of the cicada. The perfect insect is of a brown colour, and has on the upper wings two lateral whitish spots. It is very common in meadows and pastures, and is so agile, that, when attempted to be caught, it will sometimes spring to the distance of two or three feet.

The larvæ, or grubs of this insect discharge from their bodies, upon the branches and leaves of plants, a kind of frothy matter, called by the country people in many parts of England "cuckoo-spit." In the midst of this the larva goes through its metamorphosis to a chrysalis, and a winged insect. In about a quarter of an hour the whole change is completed, the fly is liberated, its wings are extended over its body, and the fine silver-like case of the larva, with all its legs and other apparatus, will be seen left behind.

## COCHINEAL INSECTS.

THE head and trunk of the lac cochineal seem to form one uniform, oval, compressed red body, somewhat of the shape and size of a very small louse, consisting of twelve transverse rings; the back is keel-shaped, and the belly flat. The antennæ are half the length of the body, filiform, and diverging, sending off two and sometimes three diverging hairs. The tail is a little white point, from whence proceed two horizontal hairs as long as the body.

They are produced from the womb of the parent in the months of November and December. For some time they traverse the branches of the trees upon which they are produced, and then fix themselves on the succulent extremities of the young shoots. By the middle of January they are all fixed in their proper situations, and, though they now exhibit no marks of life, appear as plump as before. The limbs, antennæ, and bristles of the tail are no longer to be seen. Around the edges of their body they are environed with a sub-pellucid gelatinous liquid, which seems to glue them to the branch. The gradual accumulation of this liquid at length forms a complete cell for the insect, which takes place about the middle of March. The insect is now, in appearance, an oval smooth red bag, without life, emarginated at the obtuse end, and full of a beautiful red liquid.

Twenty or thirty small oval eggs, or rather young grubs, are to be found in October and November, within the red fluid of the mother. When this fluid is all consumed the young insects pierce a hole through the external covering, and walk off one by one, leaving their nidus behind.

These insects generally fix themselves in such numbers, and so close to each other, that scarcely more than one female in six has room to complete her cell: the others die, and become the food of various insects. In the East Indies these insects have the name of gum lac, and are principally found on the trees of the uncultivated mountains on both sides of the Ganges, where nature has been so bountiful, that, were the consumption many times greater than it now is, the markets would be fully supplied. The only trouble is in breaking down the branches and carrying them to market.

The American cochineal is a native of South America. This insect is convex, with legs of a clear bright red, in both male and female, and the antennæ moniliform or bead-like. The male is a delicate and beautiful insect, the colour of the whole body a bright red, nearly resembling the pigment, usually called red lake; the breast is elliptical, and slightly attached to the head. The antennæ are above half the length of the body. The legs are of a more brilliant red than that of the other parts. Two fine white filaments, about three times the length of the insect, project from its belly or abdomen. The wings are two, erect, of a faint straw colour, and of a very delicate texture. The female has no wings, is elliptic in its form, and convex on both sides, but chiefly so on the back, which is covered with a white downy substance, resembling the finest cotton. The abdomen is marked with transverse rugæ or furrows. The mouth is situated in the breast, having a brown beak, inclining to a purple tint, that penetrates the plant on which the insect feeds. Its six legs are of a clear bright red.

When the young insects are arrived at their full growth, they adhere to the leaf of the cactus in a torpid state; and it is at this period that they are taken from the plant for use. They are soon converted into cochineal, an article, when properly prepared, of great utility to painters and dyers.

## CHAP. IX.

"Child of the sun! pursue thy rapturous flight,
Mingling with her thou lov'st in fields of light;
And, where the flowers of Paradise unfold,
Quaff fragrant nectar, from their cups of gold;
There shall thy wings, rich as an evening sky,
Expand and shut with silent ecstacy!
—Yet wert thou once a worm—a thing that crept
On the bare earth, then wrought a tomb and slept."

ROGERS.

### BUTTERFLIES.

THE butterfly may be said to consist of three parts; the head, the corselet, and the body. The body is the hinder part, and is composed of rings, which are generally concealed under long hairs with which that part of the animal is cloathed. The corselet is more solid than the rest of the body, and in which the fore-wings, and the legs are fixed. They have six legs but make use of only four; the two fore are covered by the long hairs of the body, and are sometimes so much concealed that it is difficult to discover them. The eyes of butterflies have not all the same form; in some they are the larger portion of a sphere; in others they are but a small part of it, and just appearing from the head; in some also they are small, and in others large; but in all of them the outward coat has a lustre, in which may be discovered all the various colours in the rainbow. It has, likewise, the appearance of a multiplying glass, having a great number of sides, or facets, in the manner of a brilliant cut diamond. In this particular, the eye of the butterfly and of most other insects correspond, and Leuwenhoek pretends there are above six thousand facets in the cornea of a flea. Puget adapted the cornea of a flea in such a position, as to see objects through it by the means of a microscope; and nothing, he says, could exceed the strangeness of its representations: a soldier, who was seen through it appeared like an army of pigmies; for while it multiplied, it also diminished the object: the arch of a bridge exhibited a spectacle more magnificent than human skill could perform: the flame of a candle seemed a beautiful illumination. It still, however, remains a doubt whether the insect sees objects singly, as with one eye, or whether every facet is itself a complete eye, exhibiting its own object distinct from all the rest.

The wings of butterflies are very different to those of any other fly: they have four in number, and though two of them be cut off, the animal is still enabled to fly. They are, in their own substance, transparent, but owe their opacity to the beautiful dust with which they are covered. The wing of the butterfly being observed with a good microscope, will be seen to be studded over with a variety of little grain, of different forms and dimensions generally supported upon a footstalk regularly laid upon the whole surface. The wing itself is composed of several membranes, which render the construction very strong, though light; and though it be covered over with thousands of those scales, or studs, yet its weight is very little increased by the number, and the animal is enabled to support itself for a considerable time in the air.

Butterflies, as well as most other flying insects, have two instruments, like horns, on their heads, called feelers. These are moveable at the base, and have a number of joints, by which means the insect is enabled to turn them in every direction. Those of the butterfly are placed at the top of the head, pretty near the external edge of each eye. Of what benefit they are of to the animal cannot be exactly ascertained, and all that has hitherto been said is mere conjecture. Directly between the eyes most of the butterfly kind have a trunk, which, when the animal is not seeking its nourishment, is rolled up like a curl; but when in search of food, and the butterfly has settled upon some flower, then the trunk is thrust out and employed in searching the flower to the very bottom, let it be ever so deep. This search being repeated seven or eight times, the butterfly passes on to another. The trunk itself consists of two equal hollow tubes, nicely jointed to each other. These are diurnal animals.

The large garden white butterfly is a common species, and often, in its caterpillar state, very destructive to cabbage and cauliflower plants. The caterpillars seem almost confined to these vegetables, on which they are generally to be found in great numbers from June to October. The general colour of these butterflies is white, but the male differs from the female in having a few dark spots on its wings. They first appear on wing in the middle of May, and, about the end of the same month, lay their eggs in clusters on the under sides of cabbage leaves. In a few days after the caterpillars come forth, and continue to feed together till the end of June, when they are at their full growth. They then traverse about in search of convenient places to fix themselves, where, after their change, the chrysalis may be sheltered. When such are found, they each fasten their tail by a web, and carry a strong thread of the same round their body, near the head; and, thus firmly secured, hang a few hours, when the chrysalis becomes perfectly formed, and divested of the caterpillar's skin. In fourteen days after this the fly is on the wing. The caterpillars of this latter brood arrive at full growth, and change to chrysalids in September, in which state they remain through the winter till the beginning of the following May. During this time we often see them hanging under the copings of garden walls, under pales, and in other places where they can have tolerable shelter from the inclemency of the weather.

The marsh frittillary is a small butterfly, not more than an inch and a half across the broadest part of its expanded wings. Its colour is a brownish orange, variegated with yellow and black, in a small pattern. The under sides of the wings are lighter, and chiefly orange and yellow. From these under sides having always a greasy appearance, it is sometimes called the greasy or dishclout frittillary.

In September the caterpillars may be seen in great abundance. They keep together under the cover of a fine web, which they spin to defend themselves from the inclemency of the weather; and in the protection of this they pass the winter months. During this time they are so nearly reduced to a torpid state as to require no food, nor do they venture out of their general covering till invited by the warmth of the spring. As they afterwards increase in size they spread abroad in search of food; but their local attachment is very remarkable, for neither the caterpillar nor even the butterfly will stray far from the place where it was bred. Numbers of the latter may sometimes be observed on wing in a small spot of swampy or marsh land, when not one of them is to be met with in any of the adjacent places. As they fly very low, and frequently settle, they are easily caught. The caterpillars are generally at their full growth about the last week in April: when this takes place they suspend themselves by the tail to change into chrysalids, in which state they remain fourteen days. Their mode of suspension is a singular instance of the extraordinary power of instinct. They first draw two or three small blades of grass across towards their top, and fasten them together by means of their silk: then hang themselves beneath the centre of these, each having his own little canopy. By this means they are not only hidden from the sight of birds, but defended in a great measure from the damage they might otherwise sustain from windy and boisterous weather. They feed on the devil's-bit scabious and on various kinds of the marsh grasses; eating only the opening leaves as they come up, which renders them sometimes difficult to find. This they do also only while the sun shines; for if, in the very act, the sun becomes hidden behind by a cloud, they immediately cease, but, on the return of the sun-beams, they recommence their operations with great voracity.

The upper wings of the nettle tortoise-shell butterfly, which is one of the most beautiful and common of the British butterflies, are red, and marked with alternate bands of black and pale orange; below these are three black spots, the inner one of which is square; and near the extremity of their upper parts is a white stripe. The lower wings are also red, marked with a large black patch at the base. The margins of all of them are black, with blue spots.

These butterflies are produced from their chrysalids, and first make their appearance in a winged state about the month of April. Soon after their enlargement from the chrysalis state, they discharge a few drops of reddish fluid, which, in places where they have been in great numbers, has had the appearance of a shower of blood, and been recorded by writers as the forerunner of some extraordinary event. The first discovery of this circumstance was in the town of Aix, in July 1708, and is related by M. de Reaumur. These butterflies are short-lived, laying their eggs in the beginning of the following month, in great numbers, on the uppermost stalks of the nettles, and dying very shortly afterwards. The eggs adhere by means of the glutinous moisture with which they are covered when first protruded. About the middle of the month, the young caterpillars may be seen of a light green colour on the nettle tops, enclosed in a web that covers the whole upper part of the plant; and in this they all herd together. They soon cast their first skin, when they always remove to a fresh place, leaving their old coverings hanging to the web. Here, at a little distance from their former habitation, they form a new colony. In their third skin they make another remove, but still keep together in a web. On changing this they also change their colour and become black; and as they have now increased too much in size to live in one society, they separate into companies. In their sixth or last skin they entirely separate; and in this state they often make such ravages among the nettles as to leave nothing but the stalks and fibres. Sometimes they are seen so numerous as to cover all the tops, and six or seven inches of the stalks, giving them the appearance of being enveloped in black cloth. About the beginning of June they are arrived at their full growth; when, fastening their tails by a web under the nettle-leaves, or to the stalks, they change into chrysalids. These are at first green, but, in a day or two, they change to a bright gold, or else to a greenish brown colour. They remain thus for about twenty days, when they become butterflies. Some few of this second brood live through the winter, being frequently found in a state nearly torpid in that season.

## *THE SILKWORM.*

THIS wonderful insect is found in a native state on mulberry-trees in China, and some others of the eastern countries, from whence it was originally introduced into Europe in the reign of the emperor Justinian. It is, however, at this time become, in a commercial view, one of the most valuable of all insects; affording those delicate and beautiful threads that are afterwards woven into silk, and used in garments in almost all parts of the world.

These insects are in the warmer climates of the east left at liberty upon the trees, where they are hatched, and on which they form their coccoons; but in cooler countries, where these animals have been introduced, they are kept in a room with a south aspect, built for the purpose, and fed every day with fresh leaves.

Their eggs are of a straw-colour, and each about the size of a pin's head. At its birth the larva or worm is entirely black, and about as long as a small ant; and it retains this colour eight or nine days. The worms are put on wicker shelves, covered first with paper, and on this with a bed of the most tender of the mulberry-leaves. Several ranges are placed, one above another, in the same chamber, about a foot and a half apart. The scaffolding for these ranges should, however, be in the middle of the room, and the shelves not too deep. The worm continues feeding during eight days after its birth, when it becomes about a fourth of an inch in length: it then experiences a kind of lethargic sleep for three days, during which it casts its skin. It now feeds for about five days, and is considerably increased in size, when a second sickness comes on. In the next ten days it experiences two other attacks, by which time it has attained its full growth, and is somewhat more than an inch in length, and two lines in thickness. It then feeds, during five days, with a most voracious appetite, after which it refuses food, becomes transparent, with a tinge of yellow, and leaves its silky traces on the leaves that it passes over. These signs denote that it is ready to begin its coccoon, in which it is to undergo its change into a chrysalis. The animals are then furnished with little bushes of heath or broom stuck upright between the shelves: they climb up the twigs, where, after a little while, they begin the foundation of their lodge, and are five days in spinning the coccoon; they generally remain in this state about forty-seven days. The animal now forms for its retreat a cone or ball of silk, spun from two longish bags that lie above the intestines, and which are filled with a gummy fluid of a marigold colour. The apparatus with which it is furnished for spinning the silky threads that principally compose this bag resembles, in some measure, a wire-drawer's machine, in which gold or silver threads are drawn to any degree of fineness; and through this the animal draws its thread with great assiduity. As every thread proceeds from two gum-bags, it is probable that each supplies its own; which, however, are united as they proceed from the animal's body. If the thread be examined with a microscope, it will be found flattened on one side, and grooved along its whole length, Hence it may be inferred, that it is doubled just upon its leaving the body, and that the two threads stick to each other by the gummy quality they possess.

The exterior of the coccoon is composed of a kind of rough cotton-like substance, which is called floss; within the thread is more distinct and even; and next the body of the aurelia the apartment seems lined with a substance of the hardness of paper, but of a much stronger consistence. The thread which composes the coccoon is not rolled regularly round, but lies upon it in a very irregular manner, and winds off first from one side, and then from the other. If measured, the whole thread will be found about three hundred yards long; and it is so very fine that eight or ten threads are generally rolled off into one by the manufacturers. For this purpose the coccoons are put into small coppers or basons of water, each over a small fire. The ends of the threads are found by brushing them over gently with a whisk made for the purpose; and in winding they are each passed through a hole, in an horizontal bar of iron placed at the edge of the bason, which prevents them from becoming entangled. All the coccoons are generally formed in the course of six or seven days; they are then taken off the branches of heath, and divided into classes. The best are strong, and of a pure unspotted colour. Some are white, and others yellow. The good ones are firm and sound, of a fine grain, and have both ends round and strong. Those of a bright yellow yield more silk than the others. But the pale ones are principally preferred because they take certain colours better, and because, since they contain less gum than the others, they lose less than those in boiling. Five or six days after the coccoon has been detached from the branches, the birth of the moth is prevented, as this would otherwise pierce the shell, and thereby render the coccoon useless. To prevent this the coccoons are put into long shallow baskets, covered up, and baked, for about an hour, in an heat equal to that of an oven from which the bread is just drawn after being baked. After this they are disposed in a proper manner on ozier shelves, distributed into stories, two or three feet distant from each other.

In about a fortnight or three weeks the insect within the coccoon is changed into a moth; but, no sooner is it completely formed, than, having divested itself of its aurelia skin, it prepares to burst through its prison. For this purpose it extends its head towards the point of the coccoon, and gnaws a passage through its cell, small at first, but enlarging as the animal increases its efforts for emancipation. The tattered remnants of its aurelia skin are left in confusion within the coccoon, like a little bundle of dirty linen. The animal, thus liberated, appears exhausted with fatigue, and seems produced for no other purpose than to transmit a future brood. The male dies immediately, and the female only survives him till she has laid her eggs, which are to be hatched into worms in the ensuing spring.

Silkworms, bred in Europe, must be kept in a place built for that purpose, and fed every day with fresh mulberry leaves; great care, however, is necessary while they continue in a worm state, as they are extremely susceptible of cold. See the plate containing the *caterpillar, silkworm,* and *butterfly.*

## THE MOTH.

WOOLLEN cloth and furs constitute the chief support of the caterpillar, from whence the clothes moth is produced, and therefore the parent is, by its natural instinct, directed to deposit its eggs in them. The caterpillar, as soon as it quits the egg, begins to form for itself a nest: for this purpose, after having spun a fine coating silk immediately around its body, it cuts the filaments of the wool or fur close by the thread of the cloth, or by the skin, with its teeth, which act in the manner of scissars, into convenient lengths, and applies the bits, one by one, with great dexterity to the outside of its silken case, to which it fastens them by means of its silk.

Its covering being thus formed, it never quits it but in cases of the most urgent necessity. When it wants to feed, it puts out its head at either end of its case, as best suits its conveniency. When it wishes to change its place it puts out its head, and its six fore legs, by means of which it moves forward, taking care first to fix its hind legs into the inside of the case so as to drag it along. In this manner it lives till, by the augmentation of its size its case becomes too small for the body: when this is felt it begins by making a small addition to one end; then, turning itself within the case, which is always wide enough in the middle for that purpose, it makes a little addition to the other end, so as still to preserve the widest part exactly in the middle; and in the same manner it makes every successive addition. For this purpose the insect has teeth like scissars, and when widening its case, it begins by making a slit lengthways, from the centre to one of the extremities. This opening it instantly fills up with a thin stripe of wool externally, and silk internally, in the same manner as in the other parts. It afterwards, at a little distance from this, makes another slit at the same end, which it also fills up; then, turning itself within, it repeats the same process from the centre to the other end.

In this case the animal changes into a chrysalis, and, in about three weeks, issues a small-winged nocturnal moth, of a silvery-grey colour.

It feeds during night, and though seldom to be seen in the day time, it courts the light of a candle, about which it frequently flutters, till it destroys itself. See the plate of insects, fig. 10 and 11.

## FLIES.

OF these there are various genera, the most particular of which we shall briefly enumerate, and describe.

The common flesh-fly and the large blue bottle flesh-fly are nearly similar in appearance. The former is, however, somewhat more slender, and is besides of a greyish tint, occasioned by some irregular rather long stripes on the corcelet running lengthwise, and some still more irregular marks of the same kind on the body; all of them of a cinereous grey, separated by a shining brown, which, under certain points of view, appear of a blueish tint. The legs of the common flesh-fly are black, the halteres or balancers under its wings are whitish, and its reticular eyes somewhat red.

The flesh-fly is a viviparous insect, depositing its young in a living state on the meat in our shambles and larders. These young appear under the same worm-like form as the grubs produced from the blue flesh-fly: they feed as those do, increase in size, undergo all their transformations in the same manner, and even in the fly state appear very little different. It appears that the eggs of this fly are extruded from the uterus into the cavity of the abdomen, and there undergo their first change, differing in this respect from most others of the insect tribes. When the worms have attained their full size (which is generally in seven or eight days) they quit their food, and go in search of some loose earth, in which they bury themselves and undergo their metamorphosis. See plate of insects, fig. 6.

The Hessian-fly is not quite the fourth part of an inch in length. Its thorax is dark-coloured, but marked longitudinally with two yellow lines. The grubs are white, about two lines in length, composed of ten rings, with the head pointed at the end. These are lodged and nourished in the very heart of the stems of wheat and rye, just above the root, which by their voracity they entirely destroy. The chrysalis is yellow, shining, rather more than one line long, and composed of rings. These animals are very destructive to corn.

The cheese-fly is very common, about the tenth of an inch long, and of a dark colour, with whitish wings, each marked with a black rib. The larvæ are the troublesome maggots found in cheese, generally called, by housewives, hoppers. The maggots are surprisingly strong and vigorous, and leap to a considerable distance when disturbed. The maggot, when leaping, erects itself on its tail, and, bending its head into a circle, fixes two black claws at the end of the tail into two cavities formed for their reception at the back of the head. It then exerts its muscular powers, and, in suddenly extending its body, throws itself sometimes to twenty-four times its own length. These maggots when about to change into chrysalids, desert the cheese, and in three or four days afterward grow stiff and lifeless. The fly bursts through an opening in the skin just at the head, which there divides into two parts. At its first appearance the wings are not fully formed, but it is able to run about with great activity: the wings expand by degrees, and in the course of a quarter of an hour they are perfected. Two hundred and fifty-six eggs have been found in the ovary of a single female.

The camelion fly is one of our most common two-winged insects. The egg from which it is produced is deposited by the female in the hollow stalks of reeds and other aquatic plants. From this proceeds a larva of singular structure, which is often to be seen crawling on grass and plants near shallow standing waters, or floating near the surface. The general colour of this larvæ is a greenish brown. The body consists of eleven rings, and the skin somewhat resembles parchment.

Though these animals, before their transformation into flies, live in water, air is necessary to support their principle of life; and the apparatus with which nature has furnished them for that important purpose deserves our particular notice. The last ring or termination of their bodies is open, and serves as a conductor of air. From this ring proceed a number of hairs, which, when examined by the microscope, are found to be real feathers with regular vanes. In particular situations the larvæ bend the last ring in such a manner as to reach the surface of the water or mud in which they are placed. The feathers prevent the water from entering the tube or organ of respiration; and, when the animal raises the termination of its body to its surface, in order to receive air, it erects and spreads the feathers, and by these means exposes the end of the tube to the atmosphere. When it wishes to descend, it contracts the filaments into the form of a ball, and the bubble of air contained within it serves to keep the body in a vertical position.

These insects have two large vessels or tracheæ, on each side occupying almost one half of the body. Both of these terminate in the open tube, or last ring. Though these larvæ are furnished with powers of respiration, and actually respire air, yet some of them are able to live more than twenty four hours without respiration.

In the middle part of this creature's mouth is placed a hard, pointed, horny substance, immovable, and somewhat resembling the upper mendible in the beak of a bird. On each side of this there is a small and very singular kind of process. These have lately been discovered to be the feet, or, perhaps more properly, the arms, by which the animal performs many of its movements in the water, and by whose aid alone it can move itself forward on dry land. Another principal use of these members seems to be to loosen the mud for the purpose of allowing the mouth to find easier access into it than it otherwise might do; performing in some measure the same functions in this respect as the gristle in the nose of a hog. The animal has the power of drawing these organs inward at pleasure, so as to hide them as it were within the cheeks; and from this peculiar position some persons have said that this larva carries its feet in its mouth.

When the time of its metamorphosis approaches, (which is about the middle of July) the larva leaves the water, and, climbing up the side of the bank, chooses a place where it can lie only in part immerged in water. Here it remains at rest, until it finally attains its chrysalid state. From five to ten days are occupied in attaining its complete form, and becoming a fly.

The rat-tailed worm-fly always lays her eggs in moist places, such as are frequented by the common black lizard, and they never appear on dry ground till about to undergo their first transformation. In this state the larvæ somewhat resemble a tadpole, in form; the fore-part being soft, thick, and rounded, and the tail small and tapering. They are covered with a viscous fluid, and on that account are generally found enerusted with a coat of dirt. This seems to be their colour, till they are washed, when they are found of a transparent white.

The young are no sooner dropped into the water, than, like all other animals in their natural element, they find themselves endowed with the instinct of searching for their own food, and of applying in an appropriate manner, all the members of their body to the proper uses for which they are naturally adapted.

The tail of this insect, like that of the camelion fly, is its organ of respiration; and though, like the whale, it is an inhabitant of the water, yet, like that, it is a breathing animal, and would be entirely suffocated, were it to be continued under water and excluded from access to the air.

The mouth of the gnats has a long slender trunk, or flexile sheath, inclosing five pointed bristles; it has also two feelers. The antennæ are generally thread-shaped, but those of some of the males are feathered.

These insects principally frequent woods and watery places, and are generally known to the country people by the name of midges. They live by sucking the blood and juices of the larger animals. Their larvæ are very common in stagnant waters; those of the common gnat may be seen with their heads downward, and the extremity of their abdomen at the surface; from the side of which arises the hollow tube through which they respire. Their heads are armed with hooks, that serve to seize on insects and bits of grass on which they feed; and on their sides are four small fins, by the help of which they swim and crawl along. These larvæ retain their form during a fortnight or three weeks, after which they turn into chrysalids; and all the parts of the winged insect are now distinguishable through their thin exterior covering. The situation and shape of their respiratory tube is also altered: this is now divided into two parts, and is placed near the head. The chrysalids abstain from eating, and reside almost constantly at the surface of the water; but, on the least motion, they may be seen to unroll themselves from their spiral position, and, by means of little paddles on their hinder part, to plunge to the bottom. In the course of a few days they are transformed into perfect gnats. The chrysalids swell at the head, and the flies burst from their inclosure. If at the instant of the change a breeze springs up, it proves to them a dreadful hurricane, as the water gets into their case, from which they are not yet perfectly loosened; this immediately sinks, and they are drowned.

The female deposits her eggs on the surface of the water, and surrounds them with a kind of unctuous matter, which prevents them from sinking: and she at the same time fastens them with a thread to the bottom to prevent them from floating away, at the mercy of every breeze, from a place the warmth of which is proper for their production, to any other where the water may be too cold, or the animals, their enemies, too numerous. In this state they therefore resemble a buoy that is fixed by an anchor. As they come to maturity they sink deeper; and at last, when they leave the egg, they creep in the form of grubs at the bottom.

The musqueto-fly is nothing more than a large variety of the common gnat, which is very common in the woody and marshy parts of all hot climates. It also abounds, during their short summer, throughout Lapland, Norway, and Finland, and other countries equally near the pole. The female bites and sucks the blood in such a severe manner as to swell and blister the skin in a most violent manner, and sometimes leaves obstinate sores. These insects are found in such swarms, in the woods, that whoever enters them is sure to have his face covered, and he is scarcely able to see his way before him. A swelling and disagreeable itching instantly follows the puncture, and these are succeeded by small white ulcers; so that the face of a person coming from the country is scarcely to be recognized, and it appears full of blotches. Even gloves are not always found a protection against these troublesome insects, as they often pass their stings through the seams. It is the female that only bites; the buzzing, however, of both males and females is so very loud, as to be alone sufficient to disturb the rest of persons at night.

The ox gad-fly has brown unspotted wings; and the abdomen is marked with a black band in the middle, and has dusky yellow hairs at the tip. The front is white, and covered with down; and the thorax is yellowish before, black in the middle, and cinereous behind. The female differs from the male, in having a black style at the end of the abdomen.

This insect deposits its eggs in the back of the ox; and the larva lives beneath the skin, between this and the cellular membrane. Its sac or abscess is somewhat larger than the insect, and, by narrowing upwards, it opens externally to the air by a small aperture.

When young, the larva is smooth, white, and transparent, but, when full grown, is of a deep brown. It is also supplied in this state with innumerable minute hooks, ranged in contrary directions on its body; with which, by occasionally erecting or depressing them, it is moved about in the abscess; and from this motion, and the consequent irritation, a more or less copious secretion of pus takes place for its sustenance. As soon as the larva is full grown, it effects its escape from the abscess by pressing against the external opening. When this becomes of sufficient size, it writhes itself through, and falls from the back of the animal to the ground; and, seeking a convenient retreat, becomes a chrysalis. After the exit of the larva, the wound in the skin is generally closed up and healed in a few days.

When the perfect insect leaves the chrysalis, it forces open a very remarkable marginated triangular lid, which is situated on one side of the small end. This insect is the largest of the European species, and is very beautiful: it is, however, the terror of cattle, as it inflicts great pain when depositing its eggs.

The horse gad-fly is distinguished from the rest of its tribe by having a black band in the middle and two dots at the tip of its whitish wings. The abdomen is yellow brown, with black spots at the divisions of the segments. The female is more brown than the male, and has her abdomen elongated with a cleft terminal style. The larvæ are those odd-looking grubs which are commonly found in the stomach of horses, and sometimes, though much less frequently, in the intestines. Here they hang in clusters of from half a dozen to more than a hundred, adhering to the inner membrane of the stomach, by means of two small hooks or tentacula at their heads, whose points turn outward. When they are removed from the stomach, they will attach themselves to any loose membrane, even to the skin of the hand. To do this they draw back their hooks, which have a joint near their base, almost entirely within their skin, till the two points come close to each other; then, keeping them parallel, they pierce through the membrane, and immediately afterwards expand in a lateral direction, and by these means they become perfectly fixed.

The female, when the time for laying her eggs is at hand, approaches on wing that part of the horse where she intends to deposit the egg, with her body nearly upright; and her tail, which is lengthened out for the purpose, bent inwards: she scarcely appears to settle, but merely touches the hair, with the egg held out on the projected point of the abdomen. The egg adheres by means of a glutinous liquor secreted with it. She then leaves the horse, goes to a small distance, and prepares a second egg; then, poising herself before the part, deposits this in the same way. The liquor dries, and the egg becomes firmly glued to the hair: this is repeated by various flies, till four or five hundred eggs are sometimes laid on one horse. The inside of the knee is the part on which these flies principally deposit their eggs; and next to this they fix them on the sides, and the back part of the shoulder: but always in places that are liable to be licked by the tongue. When these eggs have remained on the hairs four or five days they become ripe, after which the slightest application of warmth and moisture is sufficient to bring them into life. If at this time the tongue of the horse touches the egg, its lid is thrown open, and a small active worm is produced, which readily adheres to the surface of the tongue, and is from thence conveyed with the food to the stomach. Scarcely, however, one in a hundred arrives at the perfect state of a fly. The eggs, when ripe, often hatch of themselves, and the larvæ crawl about till they die; others are washed off by the water, &c.

The perfect fly is very tender, and but ill sustains the change of weather, and cold and moisture in any considerable degree are probably often fatal to it.

The manner in which the female sheep gad-fly deposits her egg has been seldom noticed; nor is it easy, from the obscure and rapid motion of the insect, to discern the exact manner in which this is accomplished. The moment the flie stouch the noses of the sheep, they shake their heads and strike the ground violently with their fore feet; at the same time holding their noses to the earth, they run away, looking about them on every side to see if the flies pursue. They also also smell the grass as they go, lest one should be lying in wait for them. If they observe one, they gallop back, or take some other direction. As they cannot, like the horses, take refuge in the water, they have recourse to a rut, or dry dusty road, where they crowd together during the heat of the day, with their noses held close to the ground. This renders it difficult for the fly conveniently to get at the nostril. It is most probably from repeated attacks, and the consequent rubbing against the ground, that the nostril becomes highly inflamed and sore, and occa sions their touch to be so much dreaded by the sheep.

The tipulæ, or crane-flies, have, in their general form, a great resemblance to the gnat. They have a very short membranaceous proboscis, the back of which is grooved, and receives a bristle. The feelers are two, incurved, thread-shaped, and longer than the head; and the antennæ are, for the most part, filiform. The larvæ are without feet, soft, and cylindrical, and those of the larger species feed on the roots of plants, or in the hollows of decayed trees. Both the larvæ and chrysalids of the smaller tipulæ are found in water, and are very various both in size and colour. Some, like the polypus, are furnished with a pair of arms; and others are inclosed in cylindrical tubes open at the ends. The latter swim nimbly, but the others always remain in the holes they have formed in the banks of rivulets. Some of the species spin a silken case round part of their body. Their whole frame is, in general, so very tender that a touch alone is often sufficient to crush them.

The wheat-fly, a species of the tipulæ, is about the twelfth of an inch in length; its body and legs are of a dull yellow colour, and the wings are whitish, with a winged margin. The larvæ are found in the longitudinal furrow of the grain, to the bottom of which they seem attached. Here probably sucking the milky juice which swells the grain, and thus depriving it of part, and in some cases, perhaps, of the whole of its moisture, they occasion it to shrink up, and become what the farmers call *pungled.* They infect several grains in the same ear, and some ears have been observed in which even a fourth of the grain was either destroyed, or very materially injured by them. The late sown wheat always appeared the most infected, arising, no doubt, from the seed of that sown earlier obtaining too great a degree of hardness, before the insects come out to be liable to be much hurt by them.

The female lays her eggs by means of a long retractile tube, which unsheaths an aculeus as fine as a hair, and very long.

These insects would soon become seriously injurious, were not their race kept within due bounds by several natural enemies, some of which devour them, and others, particularly the ichneumon tipulæ, deposit their eggs in the larvæ, the young of which, when hatched there, find a proper nourishment in the bodies of their hosts. This ichneumon is about the size of the wheat-fly: and in order to observe the manner of the female's depositing her eggs in the caterpillars of the wheat fly, the Rev. Mr. Kirby, as we are informed, placed a number of the latter on a sheet of white paper, and then set an ichneumon down in the midst of them. She soon discovered one of the larvæ; when vibrating her antennæ in an intense degree she fixed herself upon it, and, bending her abdomen obliquely under her breast, inserted her aculeus into the body of her victim, (which seemed by its motion to experience a momentary pain,) and there deposited a single egg. This being done, she went to a second, which was constrained to nndergo the like operation, and so on to all the rest. She never deposited more than one egg in each larva: and when she was remarked to mount one that had been pricked before, she soon discovered her mistake and left it. The size of the two insects is so nearly alike, that one young only can be nourished by a single larva; and therefore instinct teaches the parent ichneumons to deposit only this number in each.

The ichneumon manifestator is about an inch in length from the head to the extremity of the abdomen: the tail measures near an inch and a half, and the antennæ somewhat more than half an inch. The body is black, and the legs are dusky. The abdomen is cylindrical and sessile, not being connected with the thorax, as in several of the species, by a pedicle.

This diminutive animal is particularly attentive to the preservation of its offspring. All the ichneumons deposit their eggs in the body of some other creature as a nidus; Mr. Marsham, however, observed one of the above species on the top of a post in Kensington Gardens, which moved rapidly along, having its antennæ bent in the form of an arch; and, with a strong vibratory motion in them, felt about until it came to a hole made by some insect, into which it thrust them quite to the head. It remained about a minute in this situation apparently very busy, and then, drawing its antennæ out, came round to the opposite side of the hole, and again thrust them in, and remained nearly the same time. It next proceeded to one side of the hole, and repeated the same operation there. Having now again drawn out its antennæ, it turned about; and, dexterously measuring a proper distance, threw back its abdomen over its head and thorax, and projected the long and delicate tube at its tale into the hole. After remaining near two minutes in this position, it drew out the tube, turned ound, and again applied its antennæ to the hole for nearly the same time as before; and then again inserted its tube. This operation was repeated three times; but Mr. Marsham approaching too near, in order, if possible, to observe with a glass what was passing in the tube, he frightened the insect entirely away. Another time he saw several of these ichneumons at work in the same gardens. They appeared to pierce the solid wood with their tubes, which they forced in even to half their length, constantly passing them between the hinder thighs, which they closed in order to keep the tubes straight, when over resistance would otherwise have forced them to bend. It appeared truly surprising to see an instrument, apparently weak and slender, able, with the strength of so small an animal to pierce solid wood half or three quarters of an inch deep; but, on particular attention, it was discovered, that all those that appeared to pierce the solid wood, did it through the centre of a small white spot, resembling mold or mildew, which on minute examination, was found to be fine white sand, delicately closing up a hole made by the apis maxillosa, and where, no doubt, there were young bees deposited. In deep holes that were not closed the insect not only thrust in the whole tube, but in some cases the whole of the abdomen and posterior legs, leaving out only the two fore feet and wings, which it placed in contrary directions like arms. The two cases of the tube were also projected up the back, with the ends appearing above the head out of the hole.

The following is a remarkable instance of little animals' sagacity. While it had its tube inserted, the cases were, as usual, projected upwards out of the hole; and the wind being very powerful rendered it difficult for this delicate animal to maintain its situation, as these long cases were so strongly acted upon by the wind as to endanger its being overset several times. To remedy this inconvenience, with a wonderful dexterity, it brought the cases down between its legs, and projected them forwards under its body toward the head; by which means it securely retained its situation.

The great dragon fly is about four inches, and a proportionate thickness. The eyes are blue and large. The thorax is variegated with green, yellow, and black: and the abdomen generally with blue and black; but the colours vary considerably. The mouth is armed with jaws; the autennæ very thin, of equal thickness throughout, and shorter than the thorax; the wing is expanded, and the tale of the male furnished with a forked process. This insect, in its perfect state, is one of the most brilliant of the British species; they delight in sunshine, and are seldom to be seen in cloudy weather, as they then hide themselves under the leaves and branches of trees.

The parent insect, towards the end of May, when ready to deposit her eggs, seeks the warm and sheltered sides of ponds or ditches. She drops them on the surface, hovering at the same time up and down just above. They immediately sink to the bottom, and, after a little while, are hatched into larvæ of a dirty brown colour with six legs, and bearing no resemblance whatever to the parent. These flies are excessively voracious, and destroy with their forcipated jaws multitudes of the weaker water insects. This formidable apparatus is so constructed as to fold over the face when at rest, and to be suddenly thrown forwards, when in action to a considerable extent. They are also remarkable for their vigor and celerity of flight. The chrysalis differs from the larva only in exhibiting the rudiments of future wings, which are enveloped in short cases or processes on the back of the animal. After remaining in this state about two years, the animal ascends the stem of some water-plant, and, sitting some time in the sun-shine, gives birth to the insect in its perfect or ultimate form.

This generally so disengages itself from the skin of the chrysalis that it leaves it in exactly its former appearance on the stem. At the first exclusion of the insect the wings are weak and tender, and folded into a very narrow compass. During their unfolding, and till they become perfectly dry, it continues almost motionless; but they are no sooner completed than the little animal commences an inhabitant of the air, and would now be as effectually destroyed by continual submersion under water, as the larva would before have been by exposure to the air.

The ephemeræ or day flies, differ in many respects from all other insects. Their larvæ live in water (where earth and clay seem to be their only nourishment) for three years, the time they consume in preparing for their change, which is performed in a few moments. The larva, when ready to quit that state, arises to the surface of the water, and, getting instantaneously rid of the skin, becomes a chrysalis. This chrysalis is furnished with wings, which it makes use of to fly to the nearest tree or wall; and, there settling, it in the same moment quits a second skin and becomes a perfect ephemera, the mouth of which has no jaws, but is furnished with four very short thread-shaped feelers. The antennæ are short and thread-shaped; and above the eyes, there are two or three large stemmata. The wings are erect (the lower ones much the shortest) and the tail is terminated by long hairs or bristles. In their perfect state all the species live but a very short time, some of them scarcely half an hour, having no other business to perform than that of continuing the race. They are called the insects of a day; but very few of them ever see the light of the sun, being produced after sunset, during the short nights of summer, and dying long before the dawn. All their enjoyments therefore seem confined entirely to their larva state; at which time they scoop out dwellings in the banks of rivers, which consist of small tubes made like syphons, with two holes, the one serving for an entrance, and the other as an outlet; and these are so numerous that the banks of some rivers are observed to be full of them. When the waters decrease, they dig fresh holes lower down. The flies are hatched nearly all at the same instant, in such numbers as even to darken the air. The females, by the help of the threads of their tails, and the flapping of their wings, support themselves on the surface of the water, and, in an almost upright position, drop their eggs in little clusters into the water. A single insect will lay sometimes seven or eight hundred; in some places they multiply enormously, and are very frequent about the waters.

The singular quickness and ease with which these little creatures strip themselves of the slough of the nymph, in order to become flies, is very surprising. We do not draw our arm more quickly from the sleeve of a coat, than the ephemera draws its body, its wings, its legs, and the long filaments of its tail, from that complicated vestment which forms a kind of sheath for all these parts. No sooner is a rent effected in the corcelet, and the body seen through that rent, than the rest of the operation is finished in an instant. Sometimes, indeed, it happens that the filaments of the tail cannot be so quickly disengaged as the rest of the body. In this case, the insects fly away with their slough appended: and sometimes also these slender filaments are broken off.

The great lantern fly, which is the most vivid of all the luminous insects, affords a light so great that travellers, walking by night, are said to be enabled to pursue their journey with sufficient certainty if they tie one or two of them to a stick, and carry this before them in the manner of a torch. The head, which is extended forward, is hollow and inflated; that of the present species is large and somewhat oval. The wings are variegated; and the lower pair is marked each with a large ocellated or eye-like spot. Sometimes the insect is seen of three or four inches in length. The antennæ, consisting of two joints, the outer one of which is globular, are seated below the eyes. The rostrum or back (which is a jointed sheath, situated in the mouth, and containing setæ or bristles, for extracting the juices from plants, and other purposes) is four jointed, and bent inwards under the body.

The legs are not formed for leaping. These insects are common in many parts of South America.

It is asserted by Shaw, that the light emitted by this fly proceeds entirely from the hollow part, or lantern, of the head; no other part of the animal being luminous. Its most essential use is, probably, to point out the sexes to each other, serving in them the same purpose, in this respect, as the voice in larger animals.

## *THE LEECH.*

THE body of the leech is oblong and truncate, or as if cut off at both ends. These animals are cartilaginous, and move by dilating the head and tail, and contracting themselves into the form of an arch.

The medicinal is leech usually found in stagnant ponds and ditches, and is of an olive black colour, with six yellowish lines above, and spotted with yellow beneath. It is generally two or three inches in length. The body is formed with numerous annular wrinkles, which the animal has the power of expanding or contracting at pleasure. The tail ends in a circular muscle or sucker, which, when applied to any substance, readily adheres, by the animal's drawing up the middle, so as to have it pressed firmly down by the external air. By this it fastens itself with ease and security, while it extends the other part of the body in any direction; and it is so firmly fixed that it can move its head about to seek for nourishment, without any danger of being carried away by the strength of the current. When the leech is desirous of moving onward, it extends its body forward, fixes its head in the same manner that it did its tail, and then loosens and draws that up, and again fastens it near its head as a fresh point to proceed from. The head is armed with three teeth of a slightly cartilaginous substance, which are so situated as to converge when the animal bites, and leave a somewhat triangular mark on the skin. These are sufficiently strong to pierce the skin of an ox or a horse. Through the holes it forms with them it sucks the blood: this is done by contracting the muscles of the throat so as to make the blood rush through the vacuum above the wound into the stomach, which is a kind of membranaceous receptacle divided into twenty-four small cells. Here it sometimes remains for several months almost without coagulating, and affords support to the animal during the whole time. It passes off by transpiration, the matter fixing on the surface of the body, and afterward coming off in small threads. In proof of this, if a leech be immersed in oil (where it will keep alive for several days) and afterward put into water, a kind of slough will be seen to loosen from its skin, exactly of the shape of the body. When it is applied in surgery, and is found to adhere too long, it is easily removed by putting salt and pepper, or acids, upon it.

This species is viviparous, producing one young at a time, and this about the month of July. If it be confined in a glass, and kept in a room, it is said to show itself very restless before a change of weather. Other species lay their eggs on aquatic plants, and others carry them under their belly; each egg contains many eggs. Several of the smaller species may be multiplied by cutting.

## *THE SLUG.*

THE body of the slug is oblong, and has on its upper part a kind of fleshy shield; and below a flat longitudinal disk, by means of which the animal has its progressive motion. On the right side of the body there is an aperture. Above the mouth are situated four feelers, at the apex of each of the two larger of which there is an eye.

These animals are very voracious, and would do serious injury to our fields and gardens were not their numbers abridged by several of the smaller quadrupeds, and by various species of birds.

Most of the species can exist for a great length of time, several months, without food, and if their head or tail be cut off they will multiply and become distinct slugs.

The spinning slug is of a greyish white colour, with a yellowish shield, and is generally about three fourths of an inch in length. It is said to be common in woods and shady places. From the under parts it spins a thread; in which act it alternately pushes out and draws back its head, and turns it as far as possible, first to one side and then to the other.

## *WORMS.*

THE first order of worms which we shall consider, is the intestinal, which inhabit the bodies of different animals. The tape worms or tæniæ, are generally found in the alimentary canal, and usually about the upper part of it, where there is the greatest abundance of chyle, which seems to be their natural food. These are very simple in structure; for, being intended to be nourished by already digested food, they are not provided with complicated organs of digestion. Their body is flat, and composed of numerous articulations; and the head has four orifices for suction a little below the mouth, which is terminal, and continued by a short tube into two ventral canals. The mouth is generally crowned with a double series of retractile hooks or holders.

Mankind is subject to several different species of these animals, and even the people of particular countries and climates, to particular species of them. The people of England have the common tape-worm, (tæniæ solium) and rarely any other; the inhabitants of Switzerland the tæniæ lata, &c.

The head of the common tape worm is furnished with a mouth, and with an apparatus for giving it a fixed situation. The body is composed of a great number of distinct pieces articulated together, each joint having an organ by means of which it attaches itself to the inner coat of the intestine; and as these joints are sometimes exceedingly numerous, so of course will be the different points of attachment. The joints nearest the head are always small, and they become gradually enlarged as they are farther removed from it, except towards the tail, where a few of the last joints become again diminished. The body is terminated by a small semicircular joint, which has no opening. The external parts are clothed with a fine membrane-like cuticle, immediately under which is a thin layer of fibres, lying parallel to each other, and running in the direction of the length of the animal's body. The head has a rounded opening at its extremity, which is considered to be the mouth. This opening is continued by a short duct into two canals, which pass round every joint of the animal's body, and convey the aliment. The head is fixed to its place by means of two small tubercles, concave in the middle, that seem to serve the purpose of suckers. The alimentary canal passes along each side of the animal, sending a cross canal over the bottom of each joint, which connects the two lateral canals together. The internal structure of the joints is partly cellular and partly vascular: the substance itself is white, and in its texture somewhat resembles the coagulated lymph of the human blood.

The length of this worm is generally from three to thirty feet; but it has been known to reach sixty feet, and to be composed of several hundred joints.

The body of thread worms is round, thread-shaped, and very smooth. The mouth is dilated, and has a roundish concave lip.

The Indian thread worm, or Guinea worm, is common in the East and West Indies. It enters the naked feet of the slaves, and occasions very troublesome itchings, and sometimes excites even fever and inflammation. It particularly attacks the muscles of the arms and legs, from whence it is only to be extracted by means of a piece of silk or thread tied round its head. But the greatest caution is necessary in this simple operation, lest the animal, by being strained too much, should break; for, if any part remains under the skin, it grows with redoubled vigour, and becomes a cruel and sometimes a fatal enemy. This worm is five or six yards long, but no thicker than a coarse brown thread.

The body of the furia is linear, and of equal thickness throughout. It has on each side a single row of close-pressed reflected prickles.

Of this tribe only one species has hitherto been discovered, which is common in Sweden. It is about half an inch in length, and of a carnation colour, often black at the apex. It creeps up the stalks of sedge-grass, and shrubs in the marshes, whence it is often carried off by the wind; and if the naked parts of the skin of any person happen to be directly in its course it immediately adheres, and buries itself within. The first sensation is said to be like that arising from the prick of a needle; this is succeeded by a violent itching of the part; soon after acute pain, a red spot and gangrene; at last an inflammatory fever, accompanied with swoonings. In the course of two days, at the farthest, death follows, unless the worm be extraced immediately, which is very difficult to be done. The Finlanders say, however, that a poultice of curds, or cheese, will allay the pain, and entice the animal out.

Hair worms are inhabitants chiefly of stagnant waters. Their bodies are round, thread-shaped, equal throughout, and smooth.

The common hair worm is about the thickness of a horse's hair, and, when full grown, is ten or twelve inches in length. Its skin is somewhat glossy, and of a pale yellowish white, except the head and tail, which are black. It is common in our fresh waters, and particularly in such where the bottom is composed of soft clay, through which it passes as a fish does through water. It is sometimes found in the earth, and particularly in gardens of a clayey soil, after rain. It derived its name from the idea that it was produced from the hair of horses and other animals that were accidentally dropped into the water; a notion that is yet prevalent among the lower class of the people. Its Linnean name of gordius originated in the habit that it has of twisting itself into such peculiar contortions as to resemble a complicated gordian knot. In this state it often continues for a considerable time, and then slowly disengaging itself extends its body to the full length. When kept in a vessel of water, it will sometimes appear motionless, and as if dead, for several hours, and afterward will resume its former vigor, and seem as healthy as before. It is very remarkable that its bite, which it sometimes inflicts upon being taken out of the water, has been known to produce the complaint called a whitlow.

Earth worms have a round annulated body, with generally an elevated fleshy belt near the head. Most of the species are rough, with minute concealed prickles placed longitudinally, and have in the body a lateral aperture or pore.

The dew worm, which is the most remarkable earth worm, is without bones, without brain, eyes, and feet. It has a number of breathing-holes along its back, adjoining to each ring.

Near its head is placed the heart, which may be observed to beat with a very distinct motion. The body is formed of small rings furnished with a set of muscles that act in a spiral direction, and which enable it in the most complete manner possible to penetrate into or creep upon the earth. The motion of these creatures may be explained by a wire wound on a cylinder; where, when one end is drawn on and held fast, the other, upon being loosed, will immediately follow. These muscles enable them with great strength to dilate or contract their bodies. The annuli or rings are also each armed with small, stiff, and sharp beards, or prickles; which they have the power of opening out or closing to their body. And under the skin is secreted a slimy matter which they emit at the perforations between the annuli to lubricate the body, and facilitate their passage into the ground. By all which means they are enabled with great ease to perforate the earth; which, had their bodies been otherwise constructed, they could not so well have done.

These worms make their casts principally about the months of March or April, in mild weather. In rainy nights they travel about, as appears from their sinuous tracks, on a soft muddy soil, perhaps in search of food. When they appear at night on the turf, although they considerably extend their bodies, they do not quite leave their holes; but keep their tails firmly fixed, so that, on the least alarm, they can precipitately retire under the earth. Whatever food falls within their reach, when thus extended, such as blades of grass, or fallen leaves, they seem content with. They retire very deep into the earth during winter, but do not then become torpid. They are very vigilant in avoiding such animals as prey upon them. The mole, in particular, they avoid by darting to the surface of the earth the instant they feel the ground move.

## *ZOOPHYTES.*

THESE, (another order of worms) hold a rank between animals and vegetables, most of them taking root and growing up into stems and branches. Some are soft and naked, and others are covered with a hard shell.

The corallines are composed of capillary tubes whose extremities pass through a calcareous crust, and open into pores on the surface. They are entirely submarine, and from their branches being finely divided and jointed, resembling some species of lichen, they have, till late years, been arranged by botanists with the cryptogamous plants. In appearance they certainly approach very nearly to some of the vegetables; but their calcareous covering alone is sufficient demonstration of their being allied, in however humble a station, to a more elevated order of beings.

The sponges consist of an entirely ramified mass of capillary tubes, supposed by many to be the production of a species of worms which are often found straying about their cavities. This idea is now, however, nearly exploded. Others have imagined them mere vegetables. But that they are possessed of a living principle seems evident from the circumstance of their alternately contracting and delating their pores, and shrinking in some degrees from the touch whenever examined in their native waters. From their structure they are capable of absorbing nutriment from the fluid in which they are by nature immersed. They are the most torpid of all the zoophytes. The species differ very much from each other both in shape and structure. Some are composed of reticulated fibres or masses of small spines: some, as the common or officinal sponge, are of no regular shape; others are cup-shaped, others tubular, &c. The officinal sponge is elastic, and very full of holes: it grows into irregular lobes of a woolly consistence, and generally adheres, by a very broad base, to the rocks. It is chiefly found about the islands in the Mediterranean sea, where it forms a considerable article of commerce. A variety of small marine animals pierce and gnaw into its irregular winding cavities. These appear on the outside, by large holes raised higher than the rest. When it is cut perpendicularly, the interior parts are seen to consist of small tubes, which divide into branches as they appear on the surface. These tubes, which are composed of reticulated fibres, extend themselves every way, by this means increasing the surface of the sponge, and ending at the outside in an infinite number of small circular holes, which are the proper mouths of the animal. Each of these holes is surrounded by a few erect pointed fibres, that appear as if woven in the form of little spines. These tubes, with their ramifications, in the living state of the sponge, are clothed with a gelatinous substance, properly called the flesh of the animal. When the sponge is first taken it has a strong fishy smell, and the fishermen take great care to wash it perfectly clean, in order to prevent its growing putrid.

The polypes are gelatinous animals, consisting of a long tubular body, fixed at the base, and surrounded at the mouth by arms or tenacula. They are chiefly inhabitants of fresh waters, and are among the most wonderful productions of nature. The particulars of their life, their mode of propagation, and powers of reproduction, after being cut to pieces, are truly astonishing.

The green polype (a species that will fully illustrate the nature of the whole tribe) is found in clear waters, and may generally be seen in great plenty in small ditches and trenches of fields, especially in the months of April and May. It affixes itself to the under parts of leaves, and to the stalks of such vegetables as happen to grow immersed in the same water. The animal consists of a long tubular body, the head of which is furnished with eight and sometimes ten long arms or tenacula that surround the mouth. It is capable of contracting its body in a very sudden manner when disturbed, so as to appear only like a roundish green spot; and, when the danger is over, it again extends itself as before.

It is of an extremely predacious nature, and feeds on the various species of small worms, and other water animals that happen to approach. When any animal of this kind passes near the polype, it suddenly catches it with its arms, and, dragging it to its mouth, swallows it by degrees, much in the same manner as a snake swallows a frog. Two of them may sometimes be seen in the act of seizing the same worm at different ends, and dragging it in opposite directions with great force. It often happens that, while one is swallowing its respective end, the other is also employed in the same manner; and thus they continue swallowing each his part, until their mouths meet together: they then rest each for some time in this situation, till the worm breaks between them, and each goes off with his share. But it often happens that a seemingly more dangerous combat ensues, when the mouth of both are thus joined together upon one common prey:

the largest polype then gapes and swallows his antagonist; but, what is most wonderful, the animal thus swallowed seems to be rather a gainer by the misfortune. After it has lain in the conqueror's body for about an hour it issues unhurt, and often in possession of the prey that had been the original cause of contention. The remains of the animals on which the polype feeds, are evacuated at the mouth, the only opening in the body. It is capable of swallowing a worm of thrice its own size: this circumstance, though it may appear incredible, is easily understood when we consider that the body of the polype is extremely extensile, and is dilated on such occasions to a surprising degree.

The species are multiplied for the most part by vegetation, one or two, or even more young ones emerging gradually from the sides of the parent animal; and these young are frequently again prolific before they drop off: so that it is no uncommon thing to see two or three generations at once on the same polype.

This wonderful creature may be cut in every direction that fancy may suggest, and even into very minute divisions, and not only the parent stock will remain uninjured, but every section will become a perfect animal. Even when turned inside out it suffers no material injury; for, in this state, it will soon begin to take food, and to perform all its other natural functions. Two transverse sections brought into contact will quickly unite, and form one animal, though each section belong to a different species. The head of one species may be engrafted on the body of another. When one polype is introduced by the tail into another's body, the two heads unite, and form one individual.

These creatures continue active during the greatest part of the year, and it is only when the cold is most intense that they feel the general torpor of nature. All their faculties are then for two or three months suspended; but if they abstain at one time they have ample amends in their voracity at another; and, like all those animals that become torpid in winter, the meal of one day suffices for several months.

The sea marigold, which is called by Mr. Hughes, an animal flower, has been discovered in Barbadoes, and is by him considered as a sensitive pant, having many animal properties. The cave that contained these animals was near the bottom of a rocky cliff facing the sea, in the north part of the island, in the parish of St. Lucy. The descent to it was steep and dangerous, being in some places almost perpendicular. The cave contained a natural bason of water, about sixteen feet long and twelve broad, in the middle of which was a rock almost covered with them.

Round the sides of this, at different depths under the water, seldom however more than eighteen inches were seen at all times of the year seemingly fine radiated flowers of a pale yellow, or a bright straw-colour, slightly tinged with green. These had the appearance of a circular border of thick-set petals, about the size of and much resembling those of the single garden marigold.

Mr. Hughes often attempted to pluck one of them from the rock to which they were fixed, but could never effect it. For as soon as his fingers came within two or three inches of it, it would immediately contract and close together its yellow border, and shrink back into the hole in the rock; but, if left undisturbed for three or four minutes, it would come again gradually into sight, expanding, though at first very cautiously, what seemed its leaves till at last it appeared in its former bloom: it would, however, again contract, with surprising quickness, when his hand approached within a little distance of it. This gentleman also attempted to touch it with his cane, and then with a slender rod; but the effect was the same. The motion of the water, caused by the immersion of the hand or stick, was no doubt the cause of its invariably retreating when any attempt was made to touch it.

From the centre of the apparent flower proceeded four dark-coloured threads, somewhat resembling the legs of a spider. These, which were its arms or feelers, had a quick spontaneous motion from side to side. Its body seemed to be a small dark coloured tube, about as thick as a raven's quill, one end of which was affixed to the rock, and the other, which extended a little way from it, was encircled with the yellow border above mentioned.

Soon after the discovery of these surprising animals, great numbers of people came to see them. This was attended with some inconvenience to the person through whose grounds they were obliged to pass, and he resolved to destroy the objects of their curiosity. That this might be done effectually, he caused all the holes, out of which the animals appeared, to be carefully drilled with an iron instrument, notwithstanding which they again appeared in the course of a few weeks, and soon became as numerous as ever.

## *ANIMALCULES.*

THESE animals are very simple in their form, and generally invisible without a magnifying power. They are chiefly found in infusions of animal and vegetable substances.

The Vorticella, or wheel animals, are the most remarkable both in their structure, their habits, and production. In general form they bear a great affinity to the polypes, having a contractile naked body, furnished with rotatory organs round the mouth; and indeed many microscopical writers have denominated them cluster-polypes. They are very small, and generally found in clear stagnant waters, during the summer months, attached to the stalks of the lesser water plants, where they feed on animalcules still smaller than themselves. Many of the species are found in groupes, sometimes formed by the mere approximation of several individuals, and at other times by the ramified or aggregate manner in which they grow. Their various motions, like those of the polypes, are generally exerted only for the purpose of obtaining prey, the rotatory motion of their tentacula causing an eddy in the water around each individual sufficient to attract into its vortex such animalcules as happen to swim near: these the little creature seizes by suddenly contracting its tentacula and inclosing them in the midst. The stems of several of the species, into which they occasionally withdraw themselves, are somewhat rigid or scaly. The young are carried in oval integuments on the outside of the lower part of these; and, when ready to come forth, the parents aid their extrusion, where such is necessary, by writhing their bodies, or striking the little vesicle. As soon as the young one is liberated from its prison it fixes itself, and commences the necessary operations to procure its food.

The animals of the genus vibrio are very simple, round, and elongated worms, nearly all invisible to the naked eye. The species best known is the eel vibrio, which is found in sour paste, and in most sediments from an infusion of grain. Its body is pellucid, and tapers toward both ends. The general resemblance that it bears to an eel has almost universally led microscopical writers to distinguish it by that title, though its most gigantic individuals are seldom a tenth of an inch in length. When paste becomes sour, if examined with a glass it will be seen to contain multitudes of these animalcules, moving about with great strength and rapidity in every direction; and animals very similar in appearance are also frequently to be observed in vinegar. They are viviparous, and produce at intervals, a numerous progeny. If one of them be cut through the middle, several young ones, coiled up and inclosed each in a membrane, will be seen to issue from the wound. Upwards of a hundred young have been remarked to proceed from a single parent; which readily accounts for their sudden and prodigious increase. The Proteus vibrio is a species that has its name from its very singular power of assuming different shapes, so as sometimes with difficulty to be distinguished for the same animal. When water, in which any vegetable has been infused, or in which any animal substance is preserved, has stood undisturbed for some days, a slimy substance will be found on the sides of the vessel, some of which, if viewed in a microscope, will be found to contain, among several other animalcules, the proteus vibrio. It is pellucid and gelatinous, and swims about, most commonly, with a long neck and bulbous body, with great vivacity. Sometimes it makes a stop for a minute or two, and stretches itself out apparently in search of prey. When alarmed it immediately draws in its neck, becomes more opaque, and moves very sluggishly. It will then, perhaps, instead of its former long neck, push out a kind of wheel machinery, the motions of which draw a current of water, and, along with this, probably its prey. Withdrawing this it will sometimes remain almost motionless for some seconds, as if weary; then protruding its long neck it will often resume its former agility, or adopt instead a multitude of different appearances in succession. The eyes of this creature have not hitherto been discovered: it however swims with great rapidity among the multitudes of animalcules that inhabit the same water, without striking against them.

The volvox bulla is a species of animals which consist only of oval bodies, similar in appearance to soap bubbles, arranged in parties of three, five, six, and nine: among them are also some solitary ones. These collections of globules, having been put into a glass filled with sea-water, described a rapid circle round the glass by a common movement, to which each individual contributed by the simple compression of the sides of

Similar to soap bubbles.

its body, probably the effect of the reaction of the air with which they were filled.

Whoever peruses with attention the several classes of animals which these volumes contain, must acknowledge the omnipotence and wisdom of Him "who framed this scale of beings,"—must exclaim, in the words of the motto in our title page,

> "Who can this field of miracles survey,
> And not with Galen all in rapture say,
> Behold a God, adore him and obey!"

FINIS

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JAMES CUNDEE, PRINTER,
*London.*

# DIRECTIONS TO THE BINDER

## FOR PLACING THE CUTS.

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